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ABSTRACT

A limited set of behaviors of three-, four-, and five-year-old children were observed in a day-care program designed to permit the children a maximum of freedom for environmental encounters. The sample consists of 20 children with day-care experience dating back to infancy and a group of 20 children (a contrast group) without prior day-care experience. Two categories of observed behaviors are reported: (1) the children's use of three major activity areas, and (2) social interactions. The data indicate that differential use of the areas is a function of both prior experience and sex, and that the dating back to infancy children emit more positive social behaviors than the contrast group. Attempts to show relationships between the observed behaviors and IQ indicated no correlations. A series of 48 serial correlations were run using individual children. These analyses showed variation among the behaviors in the degree to which entering behavior influences later behavior. Serial correlation patterns were not apparently influenced by age, sex, or entering intellectual ability. (Author)

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Teacher/Child Behaviors in an Open Environment Day Care Program

Final Report

June 1, 1973

Syracuse University

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Co-Principle Investigators

Contract #OEG-2-2-2B005

United States Office of Education

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Abstract of Report

A limited set of behaviors of three, four and five-year-old children were observed in a day care program designed to permit the children a maximum of freedom for environmental encounters. The sample consists of 20 children with day care experience dating back to infancy (CC) and a group of 20 children (a contrast group) without prior day care experience (NCC). Two categories of observed behaviors are reported: (1) the children's use of three major activity areas, and (2) social interactions. The data indicate that differential use of the areas is a function of both prior experience and sex and that the CC children emit more positive social behaviors than the contrast group. Attempts to show relationships between the observed behaviors and IQ indicated no correlations. A series of 48 serial correlations were run using individual children. These analyses showed variation among the behaviors in the degree to which entering behavior influences later behavior. Serial correlation patterns were not apparently influenced by age, sex, or entering intellectual ability.

Statement of Problem and Objectives

The Syracuse University Early Childhood Education Center (SUECEC) program is a responsive environment educationally-oriented day care program for children between the ages of three and five years. The concepts underlying the responsive environment are similar to those identified with the British Infant Schools. This general strategy was adopted because of its compatability with cognitive-developmental theory (Kohlberg, 1968) and because of the practical problems involved in designing daily programs of ten hours duration (see Lay, 1972, for a detailed specification of program rationale and procedure). A reasonably accurate description of the program, albeit overly general, is that the children are afforded considerable freedom in selecting activities from a broad variety of available activities. The major purpose of this report is to characterize the program in terms of the types and frequencies of experiences in which the children were actually engaged. These data include social behaviors and are examined both from a normative/descriptive viewpoint and in terms of individual differences.

The Educational Program

The SUECEC day care program provides a set of circumstances designed to facilitate child autonomy in using diverse kinds of materials and to encourage social interaction between children. The program also provides for maximal adult input and extensive experiences calculated to furnish a rich educational milieu.

The 40 children enrolled at SUECEC in September, 1970, were placed in one large group -- in contrast to being sub-divided into smaller groups of 15 to

20 as is the more typical arrangement. The adult-child ratio was maintained at approximately 1 to 7. A total program space of 6000 square feet was made available for use and the differentiated arrangement of this space was a central feature of the program design. For most of the program day (7:30 A.M. to 5:30 P.M.) all children in attendance had open access to three program areas- - an active area, an expressive area, and a task-oriented area. Each area provided for a specific type of participation with differing expectations for children's behavior.

The active area was designed to encourage large muscle activity. The equipment provided included a jungle gym, rocking boats, tunnel, mat, push cart, steering toy, ride toys, walking board, wheel barrow, climb rope, large blocks, unit blocks, toy people and animals, toy cars and trucks. etc. Few restrictions were placed on children's "doing" in this area. Running, shouting, teasing, etc. were acceptable in this space.

The expressive area was arranged to facilitate creative expression and dramatic play. The equipment and materials provided included easels, work bench, tables, chairs, art media, record player, musical instruments, mirror, puppets, housekeeping furniture (stove, cupboard, doll bed, etc.) toy telephones, dishes, suitcases. Children were expected to walk - not run - in this area and to contain art media to certain specified locations.

The task-oriented area provided tables, chairs, shelving with many manipulative materials (both convergent and divergent). Included in this collection were books of all kinds, listening station, Language Master, alphabet form board, puzzles, color forms, cylinders and discs, stencils, paper, pencils, felt pens,

etc. The ground rules for use of this area included an expectation of sedentary involvement and the expectation that each individual return any material be used to the shelves after use.

Children were also regularly invited to participate in certain "invitational" events which included snack, story, music activities, outdoor play, cooking activities, field trips. These were available to all children at certain periods of time but were typically not mandatory for any child. The situation provided for the child a very rich set of circumstances to which he had the same kind of informal access typical of a "friendly neighborhood".

The 20 Children's Center youngsters (hereafter designated as CC) were introduced into this program for the first time in October, 1970, as were the 20 selected as a comparison group (hereafter designated as Non-CC). For the Non-CC Ss this was a first experience in any type of program setting. The CC Ss had, on the other hand, been day care program participants together in the same group since infancy. The specific program they had encountered just prior to leaving the Children's Center is described by Lally et al. (1970) as transitional from a traditional type nursery school of homogeneous age groupings to a multi-age arrangement with increased individual options for location and selection of activity. Therefore, although most of the CC Ss had been in a highly structured group setting as toddlers they had some exposure to a more open setting toward the later portion of their Children's Center experience.

Upon entering the SUECEC program, both groups -- CC and Non-CC Ss, encountered the same environment, the same options, and the same expectations. The choices and behaviors in this new setting were observed and recorded across the 1970-71 program year and used as the dependent measures analyzed for the present report.

A prior report (Lally, Lindstrom, Meyer and Lay, 1971) on the comparison of intellectual characteristics of the two groups found few significant differences on the sub-scales of the ITPA and no significant differences on Stanford-Binet scores. It was suggested in that document that difficulties inherent in providing matches ex post facto might account for the absence of evidence of the superiority which might have been expected for stimulation group (CC Ss). With one exception, the matches were considered generally satisfactory on gross variables of sex, race, age, parent occupation, and parent education. Doubt was expressed, however, as to whether the matches selected in September, 1970, came from homes reflecting the same degree of disorganization as the CC group. These issues will be reexamined in this report as they have relevance to interpreting the findings of the present study.

A basic question being addressed is whether behavioral data will reflect differences between children receiving early care in stimulating group situations and children who have not been previously associated with day care programs. It was anticipated that behavioral data would reflect whatever differences do exist whereas test data might not. The extent to which this is the case is the focus of this report. The aspects of behavior examined include (1) children's choice of locations in the program setting, (2) interaction with peers, and (3) interactions with adults.

Method

Sample

The CC group of 20 children was composed of children from low- and middle-income homes. Their ages ranged from 3 years to 4 years and 10 months upon transfer to the SUECEC program in October 1970. They had an average of 37.4 months (S.D. = 10.21) in prior day care. Nineteen of these children were matched to a Non-CC child on the following criteria: age, sex. race, education and occupation level of parents. In addition to the 19 matched pairs, data for the unmatched CC child (white male) and Non-CC child (black female) are included in the analyses conducted for this study. A summary of the characteristics of the CC group and the Non-CC group are contained in Table 1.

As we pointed out in the previous study on intellectual characteristics (Lally, et al, 1971), the CC group were, in some cases, from very disorganized home situations. In fact, several had been transferred from a longitudinal control group to become recipients of day care service because CC staff observations on the children and their families indicated an urgent need for day care. This was as true for some of the middle-income CC families as of the low-income group. Although degree of need for day care was not a prime consideration for the selection of the matches, it was later learned that family disorganization did exist in some of these instances as well. However, the extent to which the CC group are from qualitatively different home circumstances is not easily determinable and there is certainly no means of answering the more potent question of whether their situations were significantly different during the first three or four years of life.

Table 1

SUMMARY OF BACKGROUND CHARACTERISTICS OF CC AND NON_CC CHILDREN

	CC	Non-CC
Race		
Black	12	12
White	8	8
Sex		
Male	9	8
Female	11	12
Family Situation		
Intact home	9	12
Father not in home	7	7
Living with other than own parent(s)	2	1
Adopted as infant - intact home	2	0
Father's Occupation		
Professional	1	1
Technical	2	2
Skilled	1	1
Semi-skilled	7	6
Unskilled	0	4
Mother's Occupation		
Professional	5	1
Technical	1	0
Skilled	2	5
Semi-skilled	4	3
Unskilled	4	5
Housewife	4	3
Student (tech, or bus. school)	0	3
Father's Education		
9th or less	3	2
10 - 11th	3	4
H.S.	2	5
Some College	3	0
B.A. Degree	0	0
Some graduate work	1	1

Table 1 (cont.)

Mother's Education	CC	Non-CC
9th or less	3	1
10 - 11th	6	1
H.S.	2	11
Some College	5	6
B.A. degree	3	1
Some Graduate Work	1	0

Observational Procedures

For an eight month period, from October, 1970 through May, 1971, observations of all 40 children enrolled in the SUFCEC program were obtained on a point time sampling basis, that is, during a set period of one minute the observer noted whether any of a selected set of events or encounters occurred. For those which did occur notation was made. Observation, as used in this report, refers to the notations made by trained observers after he has focused on an individual child for a one minute period -of which of a given set of pre specified events or encounters occurred for that child at any point during that minute. The recording was done on a binary basis and, thus, multiple occurrences of any event throughout the minute are not discriminated in the notation. For each observation a record was produced of which of a multiple set of events occurred (but not how often any occurred within the minute).

The names of the 40 children enrolled in the SUECEC program were randomly arranged into eight blocks of five subjects each and during a given observation session (usually of two or three hours duration) a trained observer was assigned a block of five names and a second block of five alternative names. Upon entering the program setting the observer determined whether the five subjects in the assigned block were in attendance. If so he disregarded the second block. If not, he replaced those absent with the alternative names. If the original subjects arrived later the alternatives were dropped and the arriving subjects included.

The observer then focused on each of the subjects from the assigned blocks in turn. That is, he located the first listed subject in the program

setting and immediately observed him for a continuous one-minute period. At the end of one minute he made the pertinent recordings on a special form. He then located the second subject, observed one minute, made pertinent recordings, located third subject, etc. He rotated through the block of names in each rotation.

A maximum of eight observations per subject per session were made. Each subject was observed for approximately 30 separate one-minute observations during a two to three week period each month. A mean of 230 minutes of sampled observations were collected per child for the program and 9238 minutes across children in the SUECFC setting.

The assumption, of course, in this method of data collection was that by sampling on a random basis across different days, weeks, and months the frequencies obtained are adequately representative of the frequencies which would be found if all minutes within the time spans were considered. The frequencies referred to throughout this report have been calculated in terms of proportion of the total number of observations in which the given specified event occurred.

Observers. Ten persons participated as observers and most of the data were collected by seven of this group. All were advanced undergraduate or graduate students in developmental psychology or education. Some were involved in the initial development and refinement of the observation codes. All received instruction and had series of practice sessions prior to formal data collection.

Reliability. Preliminary analyses of reliability were done on child observations using 32 sets of simultaneous observations obtained by eight

pairs of observers during October and November. Percentage of agreement was determined for each of the individual items on the initial form and the range was from 71.9 to 100. Those items in the seventies were eliminated in subsequent revisions and none included the present report and the percentage of agreement on all retained items were from 81.3 to 100 with most falling in the nineties range.

Results

A code was devised prior to the November 1970 data collection for which the observer could utilize Optical Scanning Forms as the recording sheet. Each observation thus was processed with scanning equipment available at the Syracuse University Psychological Services Center. The scanning procedure produced a punched data card which retained all of the data in a form in which they were available for various kinds of analysis.

The means and S.D.s of proportions for each of the observational codes included in this report were derived from the frequencies. Each of the three time points represent the means of two months of observations beginning with December.[1] The codes were categorized in terms of the children's utilization of space and their social behaviors and will be considered in that order. All statistical analyses were based on log transformations of the proportion data.

[1] Data are available for November, but not October, It was decided to pair the months beginning with December in order to include the final two months of the Program, April-May, in the analyses. In addition, the form of some of the codes were modified during October and would, therefore, not provide continuity.

Space Utilization. The first question with respect to space utilization is whether the children had differential preferences. The means for the Active, Task, and Expressive areas are .36, .17, and .11, respectively. A within groups ANOVA indicates that the differences between frequency of area location are statistically significant ($F = 37.2$ $df = 2/72$ p .001). Neuman Keuls tests for individual comparisons shows that all differences are statistically significant. These analyses permit the conclusion that overall, the children demonstrated a hierarchial preference for space utilization in the order Active, Expressive, Task. These data were further examined to determine the degree of relationship in use of the areas. Since a child could never be located in two places at the same time, the correlations would have to be negative. Thus, a significant negative correlation means that the utilization of one area is inversely related to the use of the second area. The only statistically significant correlation occurs between use of the Expressive and Active areas ($r = -.44$; $df = 38$; $p = .01$). An examination of each child's use of the two areas indicates that children who were in the Active area more frequently were less likely to be found in the Expressive area. Obviously use of either the Expressive or Active areas was unrelated to use of the Task area. It should be noted that this finding is not an artifact of the variances: the Task area variance was larger than the others.

The next set of analyses examines differences in location usage as a function of subject characteristics. For the purpose of this report two dimensions of subject characteristics were examined: sex and previous day care experience. In all cases the data were analyzed using a repeated

measures ANOVA with sex (S) and prior experience (E) as between-groups variables and observations on repeated occasions (T) as the within-groups variable. Table 2 includes the data included in the various analyses.

Location in the Active Area. Both the S and the E variables were statistically significant ($F = 6.1$; $df = 1$ & 36; $p = .03$ and $F = 14.4$, $df = 1$ & 36; p .001, respectively). Examination of the means indicates that the male children and those children with prior day care were more frequently located in the Active area. The interaction between S and E was not statistically significant. Analysis of the trends over time was statistically significant ($F = 5.2$; $df = 2$ & 72, p .01) but an examination of the means does not reveal any consistent trend. Specifically, the means form an approximation of an inverted V rather than some positive or negative function. None of the interactions with T were statistically significant.

Location in the Expressive Area. Again both the S and E variables were statistically significant ($F = 8.6$, $df = 1$ & 36, p = .01 and $F = 16.2$, $df = 1$ & 36, $p = .001$ respectively) but the differences were in the opposite direction from those reported for the Active area. This result is, of course, not surprising because the data for the Active and Expressive areas are not independent ($r = -.44$). There was also a significant trends (T) effect ($F = 10.5$, $df = 2$ & 72, $p = .001$) in the direction of a decrease in use of the Expressive area after the first two months included in the analyses.

Location in the Task Area. In the case of the Task area only the E variable was statistically significant ($F = 4.9$, $df = 1$ & 36, p .02). Examination of the means indicates that the children with prior day care were

Table 2

Means and Standard Deviations of Proportions for Area Locations by Sex and Previous Day Care Experience

	Area Location					
	Active		Expressive		Task	
Groups	M	SD	M	SD	M	SD
MCC	.43	.14	.12	.05	.08	.06
FCC	.39	.11	.16	.07	.10	.08
MNCC	.35	.12	.19	.09	.17	.11
FNCC	.28	.09	.22	.08	.11	.09
Total	.36	.14	.17	.09	.11	.09

located less frequently in the Task area. There was also a significant trends effect (T) ($F = 3.2$, $df = 2$ & 72, $p = .04$). The data indicate a consistent use of the area for the first two time periods followed by a slight decline in the last time period.

The ANOVAs provide some indication of group differences and trends but do not provide evidence about the consistency with which the areas are used. Information about consistency of location usage would reveal something about individual fluctuations over time; that is, do areas change in their attractiveness relative to other areas. In order to examine this question intercorrelations among the time periods, for each area, were determined and are reported in Table 3. As one might anticipate, the correlations are generally higher for adjacent time periods than those separated by two months. The data also show greatest consistency in the use of the Active area and the least consistency for the Expressive area. These results along with those resulting from the ANOVAs suggest that even though there are generally consistent group effects, the children, in general, display considerable variability in their usage of the three locations. Stated somewhat differently, the children sample widely among the areas while at the same time they have somewhat consistent preferences, at least for the Active and Task areas. A major task of subsequent analyses is to determine if there are other characteristics of the children (C.A., I.Q., etc.) which are related to area location.

Social Interactions

The next series of analyses are concerned with the characteristics of

Table 3

Consistency in Use of Area Locations

(Intercorrelations Between Time Periods)

Time Periods	Area Location: Active	Expressive	Task
1VS2	.41**	.37**	.46**
1VS3	.29*	.17	.14
2VS3	.55**	.26	.45**

* p >.05

** p >.01

the social interactions of the children with both their peers and the adults in the situation. The same strategy of analyses was employed with these data as for the area location data. The means and S.D.s are presented in Table 4.

Positive Verbal Peer Interaction. A significant main effect for the E variable was found ($F = 9.1$, $df = 1$ & 36, $p = .004$). Examination of the means indicates that the children with prior day care experience emitted more positive interactions. The trends analyses (T) was significant as well as the T x E interaction (see figure 1). These curves show that the CC group started at a higher level and gained more rapidly than the non CC children. The combined results mean that all the children changed significantly and that the CC children were both higher and gained more than the contrast group.

Verbal Peer Interaction. The results of the ANOVA for this observation code exactly repeats the previous analyses; a significant E effect ($F = 10.8$, $df = 1$ & 36, $p = .002$), a significant trends effect ($F = 32.5$, $df = 2$ & 72, $p = .001$); and a significant trends by experience interaction ($F = 3.2$, $df = 2$ & 72, $p = .05$). The trends by experience interaction is very similar to that shown in figure 1; the curve for the CC group is higher and steeper than for the non-CC group. That the two sets of results are essentially similar is no doubt a function of the high correlation between the two codes ($r = .85$). This means, of course, that the vast majority of verbal peer interactions are positive.

Child-Adult Interactions.

Adult Verbal Interaction. The data for the three child-adult codes are

Table 4

Means and Standard Deviations of

Proportions for Social Interactions

Social Interactions

	Positive Verbal Peer Interactions		Verbal Peer Interactions	
	M	SD	M	SD
MCC	.52	.16	.53	.15
FCC	.53	.17	.52	.16
MNCC	.46	.14	.40	.12
FNCC	.38	.12	.39	.13

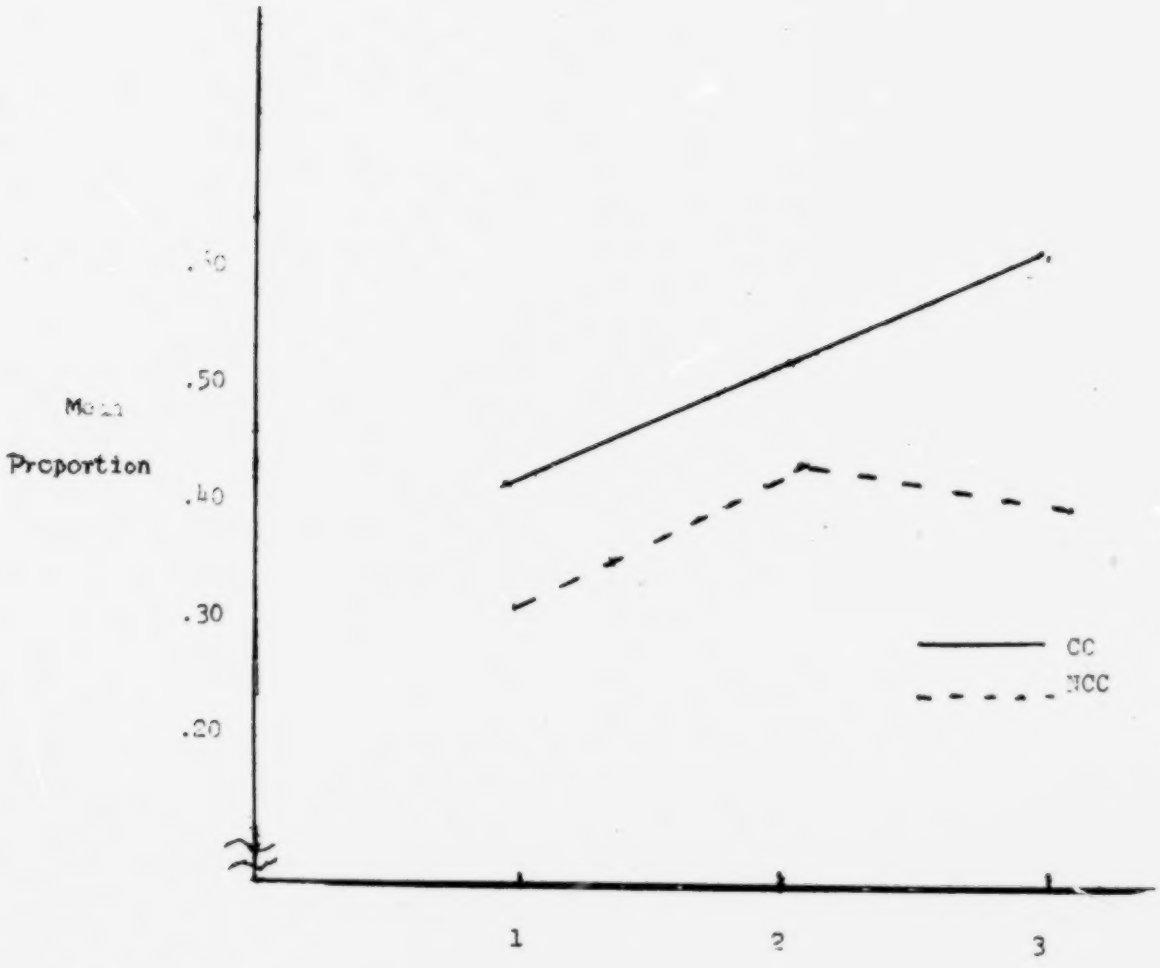


Figure 1. Mean Proportion of Verbal Peer Interactions for CC and NCC Children at Three Time Points.

summarized in Table 5. The analyses of the children's verbal interactions with adults showed a significant trends effects ($F = 37.6$, $df = 2$ & 72, $p = .001$). Examination of the means, however, fails to show a consistent trend; that is, the curve can be described as an inverted V. The trends by experience interaction is also significant ($F = 3.1$, $df = 2$ & 72, $p = .05$) and is depicted in Figure 2. There is an interesting reversal in these data from previously reported data because the NCC group shows greater interactions with adults (at the last data point) than the CC children. Thus, it appears that the NCC children, more than the CC children, interact with adults. In fact, comparisons of the means suggests that the NCC children may interact more with adults than peers and the opposite is the case for the CC children.

Request for information (from Adult). A significant Trends effect ($F = 16.9$, $df = 2$ & 72, $p = .001$) and a significant Trends by Sex effect ($F = 7.6$, $df = 2$ & 72, $p = .001$) was found for this code. Examination of the means for both effects does not indicate any clear trend. The overall trend effect forms the inverted V which, it appears from the TXE interaction, is a function of the females. Specifically, the boys increase from the first to second time period and remain constant whereas the girls show a larger initial increase but then decline.

Positive Adult Verbal Interaction. The only significant effect for this observational code occurs for Trends ($F = 38.2$, $df = 2$ & 72, $p = .001$). Again the inverted V best describes the curve.

Presented in Table 6 are the correlations between test points for all of the social behaviors. It will be noted, that, in contrast with the area location data, there is a high degree of consistency for the social behavior categories. When the correlation data are considered along with the ANOVA

Table 5

Means and Standard Deviations of Proportions for

Child--Adult Interactions by Sex and Previous Day Care Experience

	Verbal Interactions with Adults		Positive Adult Verbal Interactions		Child Requests Information	
	M	SD	M	SD	M	SD
MCC	.49	.16	.47	.15	.07	.05
FCC	.47	.14	.48	.17	.05	.02
MNCC	.52	.17	.53	.18	.07	.03
FNCC	.49	.15	.50	.16	.07	.04

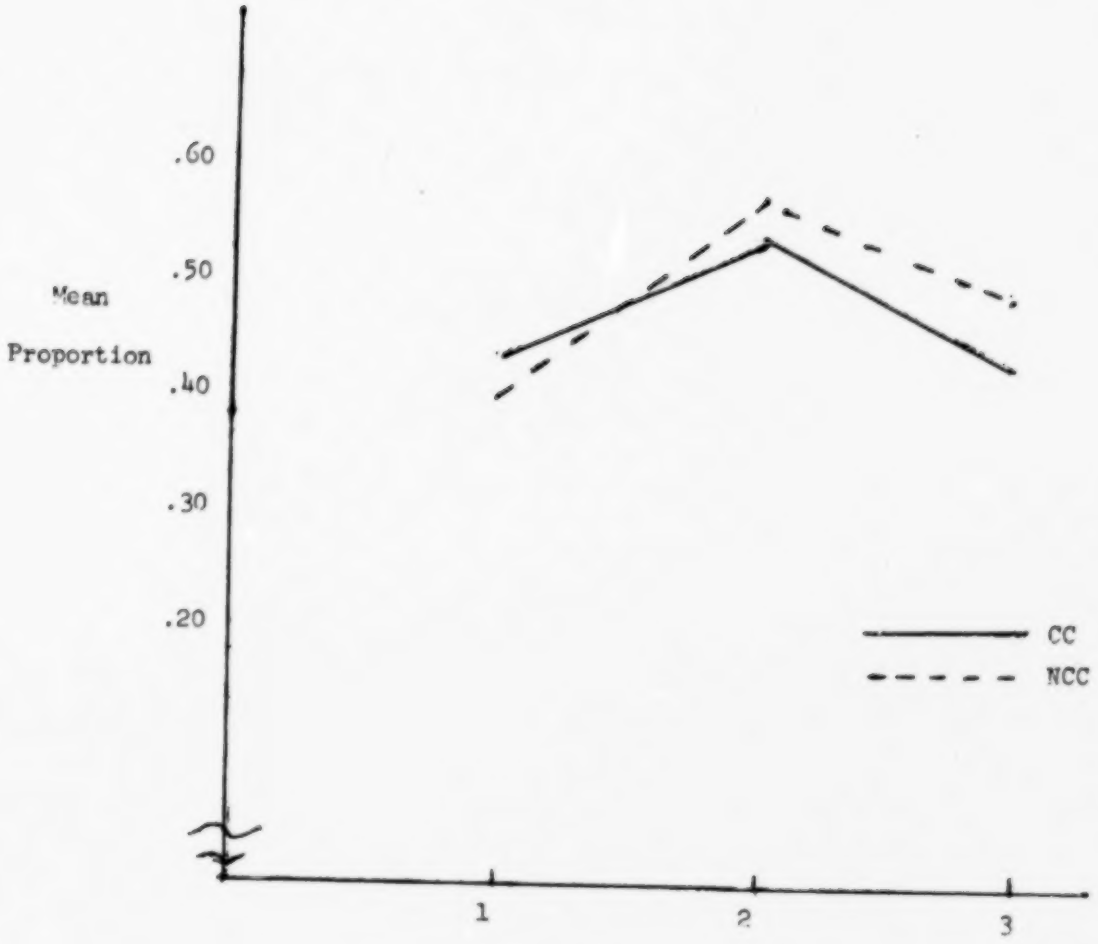


Figure 2. Mean Proportion of Verbal Interactions of Children with Adults for CC and NCC Children at each of Three Time Points.

Table 6

Consistency of Social and Adult

Interaction Behaviors over Time

	Positive Verbal Peer Interactions	Verbal Peer Interactions	Verbal Interactions with Adults
1 vs 2	.64	.63	.56
1 vs 3	.65	.77	.70
2 vs 3	.64	.70	.67

	Positive Adult Verbal Interactions	Child Request Information
1 vs 2	.56	.64
1 vs 3	.70	.68
2 vs 3	.47	.59

data, it appears that the children with prior day care initially emit more social responses (by our definition) and that they maintain their reletively higher output over time.

One question that might arise from the peer interaction data is with whom does each group interact? The mean proportion of responses for each child in each group directed towards members of the child's group was determined. In every case the direction of the difference was in favor of interacting with a member of one's own group. In interpreting these results it should be kept in mind that possibly the NCC children did not want to interact with the other group.

All of the observation codes included in this report were intercorrelated using each of the time points. Although the purpose of developing this matrix was to examine the data for possible unsuspected relationships, it was thought that the relationships between area locations and social behaviors would suggest where the positive social interactions occurred. For example, the patterns of correlations between Verbal Peer interactions and area locations show positive relations for the Active Area and negative correlations for both the Expressive and Task areas (the magnitude of the r's fluctuates over the time periods with several of them within each area reaching significance). These correlation patterns are to be expected in the sense that the children are more likely to be mutually involved in activities in the Active area whereas in the other areas the activities are more solitary (Painting, jig-saw puzzles). A similar pattern of correlations occurs for all peer interaction behaviors. A different pattern

emerges in terms of interactions with adults and area locations. Again the results are not surprising; the correlations between adult verbal interactions and Task area are consistently positive whereas the correlations with the Active area are consistently negative. The correlations with the Expressive area are inconsistent and in no instance is there a significant correlation. These data suggest that children's interactions with adults, when they occur, are more likely to happen in the Task area.

An interesting pattern emerges from the peer-interaction and adult interaction data which may have significance for describing programs. Specifically, children who spend more of their time in the Active area are more likely to interact with peers than adults. Conversely, children who are located more frequently in the Task area are more likely to interact with adults. Assuming that interactions with adults is a positive event (it's not always), then children who use the Task area more frequently are receiving greater benefits from adult interactions. (A more detailed analyses of adult behaviors will be necessary to determine if interactions with adults are, in fact, positive.) An examination of the intercorrelations between Verbal Peer Interactions and Adult Verbal Interactions provides only meager support for the foregoing conclusion. Specifically, the conclusion requires negative correlations. In only one instance was there a significant negative correlation.

In considering the large number of observational codes, we next became interested in the relationships between these codes and measures of the children's ability. Many indices were administered to the children, most of which generated

relatively little variance (conservation tasks, Ravens Progressive Matrices, a classification task). Two measures yielded sufficient variance to warrant inclusion in the correlation matrix: the Stanford-Binet (SB) and the Illinois Test of Psycholinguistic Ability (ITPA). Because we are working with only 40 subjects, it was necessary to select a single ITPA measure so that our 10 x 10 matrix would include four subjects for each variable. An examination of the intercorrelations among the ITPA variables indicated that the Grammatical Closure (GC) subtest had the highest correlation with the total score and the largest variance. This subtest was therefore selected for inclusion in the analyses. In addition CA was included.

The correlations are presented in Table 7. The results are clearly disappointing; only two correlations are statistically significant and the largest accounts for only 10 percent of the variance. These negative correlations involve the Task and Active areas and indicate that the older children use these areas less often. None of the correlations including the SB even approached significance but the GC approached significance for the Expressive and Task areas -- and in the expected direction. However, the GC score is highly and negatively ($\underline{r} = -.70$) related to age (age corrected scores were used in these analyses so the negative correlation means that the older children in this sample are performing less well, relative to their age peers in the norm group, than the younger children) suggesting a contaminated correlation. A partial correlation between Task area and GC, with CA partialed out, substantially reduces the correlation (partial $\underline{r} = .10$). A similar analysis for the Expressive area did not meaningfully alter the

correlation because use of the Expressive area is not related to CA. (Incidentally, the low rs with SB, relative to GC is a function of a much lower correlation between the SB and CA -- r = -.29 -- which means that the older children in this sample did not fall behind the norm group to the same degree as occurred for the GC). Examination of the remaining correlations in Table 7 indicate no other significant relationships.

As part of the overall anlayses plan, it was thought that a factor analyses might provide a clearer picture of the structure of the variables under consideration. The data in Table 7 suggest, however, that two factors will readily account for everything: a social interaction factor and a cognitive factor. As shown in Table 8, this is precisely what we have; two factors with CA loading heavily and negatively on the cognitive factor. The two factors, incidentally, account for approximately 72 percent of the variance. Thus, there is a Social Interaction factor with the active area loading on it and a cognitive factor with only negligible loadings from the social interaction variables.

The final formally planned phase of statistical analyses is concerned with the general problem of how best to analyze change scores. An excellent discussion of the problems of assessing change scores was presented by Bereiter (1963) in a book edited by Harris (1963). The specific issues involved are beyond the scope of this report, the major issues involve the reliability of change scores and the correlated problem of regression effects. There is, however, another problem involving the effects of using subjects as replications; that is, pooling scores over subjects. An excellent example of the problem exists in the earlier portions of this report in which repeated measures ANOVAs were used. For those analyses we pooled observation scores over children and

Table 7

Intercorrelations of Observational Codes and the Stanford Binet, Grammatical Closure and Chronological Age

	SB	GC	CA
Expressive	.00	.29	-.09
Active	.16	.12	-.31*
Task	.10	.30	-.33*
Child Asked Question	.23	.09	-.08
Child Asks Question	.11	-.12	.19
Verbal Peer Interactions	.29	-.05	.06
Verbal Adult Interactions	.23	-.05	.03

*$p > .05$

Table 8

Factor Structure of the 10 x 10

Correlation Matrix (Varimax Solution)

	Factor Loadings	
	I	II
Expressive	-.28	.18
Active	.43	.25
Task	-.28	.33
CA	.03	-.73
SB	.28	.47
GC	-.05	.74
Child Asked Question	.56	.10
Child Asks Question	.68	-.13
Verbal Peer Interaction	.90	-.03
Verbal Adult Interaction	.86	-.01

then analyzed the differences between the means. (It should be noted that this procedure does not take account of initial status and therefore coincides with one of the problems raised by Bereiter). This procedure masks possible individual variation in patterns of performance over time. It is quite possible that significant changes in means can occur (as they did in this study), but individuals may be shifting drastically within that distribution. That this may have occurred in our analyses is suggested by the correlations between time points (see pp. 24).

Besides statistical considerations there are theory oriented reasons for examining the data in terms of the single individual. This study developed out of an interest in the match-mismatch hypothesis -- the degree to which a child's behavior in a relatively free and open educational environment seeks out activities that are consistent with his competencies. Children reach competency levels at different time points and there is good reason to believe that behavioral variation within a child is quite sensitive to these developmental changes. Here the problem of summing over children completely masks the effects of these developmental variations. And, it must be noted, the widely used practice in psychological and educational research of using extreme groups capitalizes on chance (the inclusion of correlated variables) and regression effects.

A procedure for analyzing successive multiple observations in the single case which also handles the problem of sequential dependency has been described by Holtzman (1963). Specifically, Holtzman's procedure permits an assessment of the degree to which performance at any point in a series of successive time points is dependent or independent of performance at some earlier time point.

If the set of observations are highly dependent, then it is unlikely that the treatment had any effect -- the initial status of the subject accounts for all subsequent behaviors. If the set of observations are initially dependent but become less so over time, one might conclude that the treatment(s) had effects overcoming initial status. Finally, assume for the moment, that the treatment is effective but interacts with some characteristic (hopefully identifiable) of the child. A comparison of the sets of relationships would provide evidence that the variable is developmental -- an important finding.

The procedure described by Holtzman involves serial correlation coefficients (product moment correlations) requiring a sizeable number of equally spaced measurements or observations. Specifically, the procedure involves the computation of a series of correlations that involve increasing "lag". For example, a lag_1 correlation ($\underline{r}_1$) involves pairing adjacent measures on the time dimension (1-2, 2-3, 3-4, ...t -n); lag_2 involves pairing measures two time-units apart. It is possible to continue the pairing of observations until the number of time units approaches the maximum. Since the number of pairs decreases with each successive lag, the meaningfulness or stability of the resulting $\underline{r}$s decrease so there is in actual practice an upper limit to the number of correlations that can be generated from a set of measures. Obviously the more measures available the more lags it is possible to run. In the present study, it was possible to generate 40 data points comprised of six-minute samplings of observations.

The use of the serial correlations procedure in this study is admittedly tenuous because of the limited number of observations and the use of six-minute observation intervals which obviously raises questions about their reliability.

In addition, as the previous data analyses proceeded, it became clear that many of the measures of interest simple did not generate sufficient variance to be useful. For example, we had particular interest in running the serial correlations on the Task area data but found too many zero entries to produce meaningful data. Indeed we had to be satisfied in using the technique only with the Active area because it produced the largest frequencies. Examination of the observation data also dictated the use of the three social interaction variables (Child Asks Questions, Verbal Peer Interactions, and Verbal Adult Interactions).

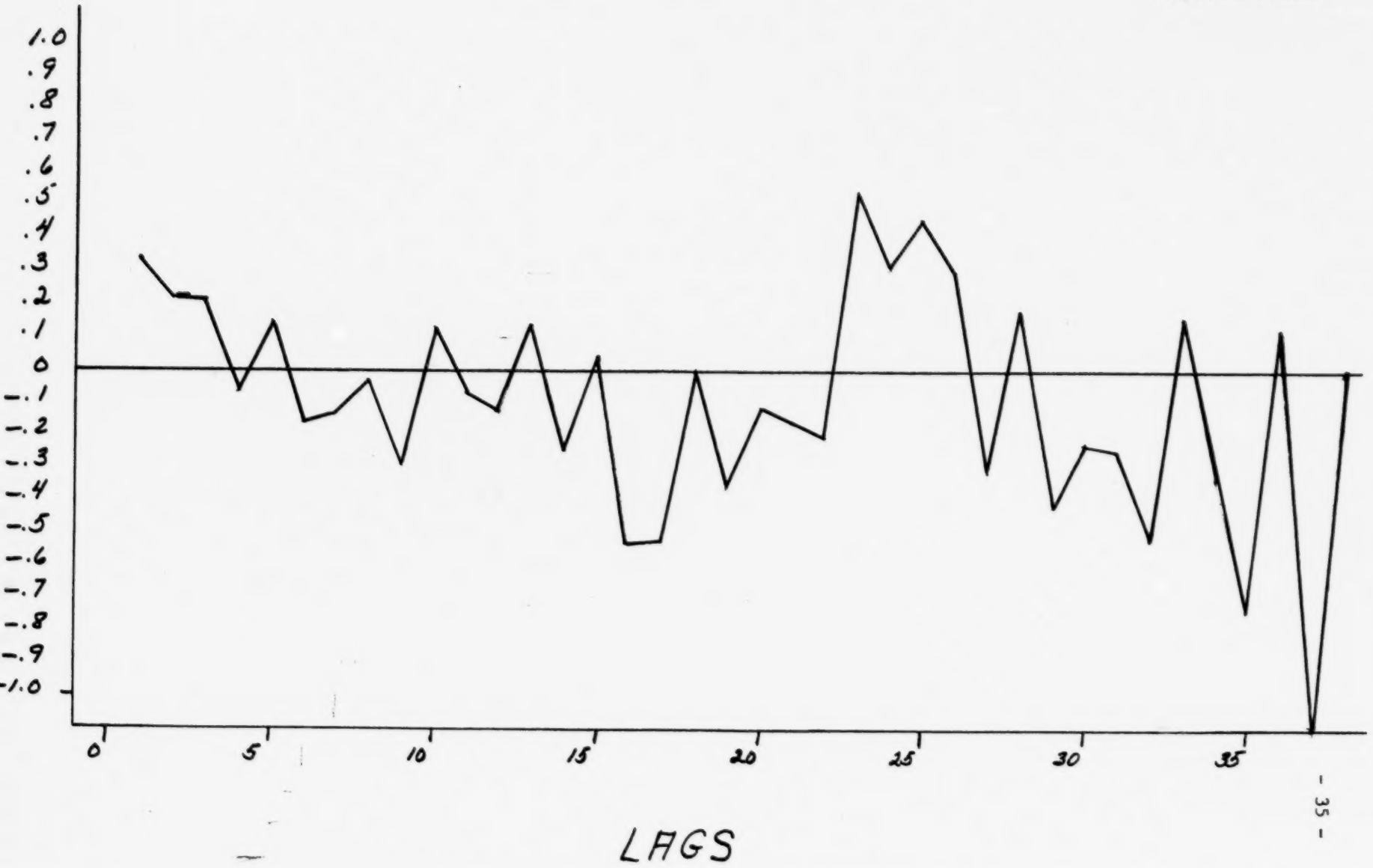
The problem of determining the number of children to employ in the analyses was also difficult to resolve. It had been planned not to use all 40 children because of the enormity of the analyses problem. Instead, subjects were to be selected on the basis of specific characteristics of interest; high or low SB, ITPA, CA, and sex. But, as earlier analyses showed, these variables were not particularly related to the observed behaviors. Given these problems, it nevertheless seemed useful to proceed with the serial correlations because this technique has not been used with educational data and they might provide, at the very least, some additional information about the technique if not the nature of the data. A total of 12 children were selected on the basis of the four variables and analyses were completed for the observation codes as described earlier. A total of 1920 correlations were computed. The data are summarized in a series of 48 correlograms which are plots of the magnitude of each serial $\underline{r}$ as a function of the amount of lag. The data are organized by subject; subject characteristics are described followed by an interpretation of each correlogram.

Subject #1. This is a male child with one of the highest Binet IQ scores (118) among the male subjects. He is also one of the older children in the sample and had the highest participation in the Active Area and had a high level of Peer Verbal Interactions. His question asking behavior was very low and his verbal interactions with adults, in general, was moderate.

The correlogram for participation in the Active Area indicates relatively little serial dependence during the first 15 lags. There is relatively little in the way of discernible trend; significant negative rs occur at lags 16 and 17 and significant positive rs at lags 24 and 25. These correlations suggest that the child's previous behaviors are generally not related to his subsequent participation in the Active Area.

A slightly different picture emerges for Question Asking (to adults) behavior where the initial lag is positive and significant ($p = .05$) and then a fairly consistent change until the rs become negative and significant at lags 11 and 13. Thereafter, the rs fluctuate around zero. Here the picture suggests that this aspect of the child's behavior changed as a function of some aspect of the program. An examination of the data indicates that the child's initially low frequency of question asking increased for a period of time and then regressed to its original level. An interesting, but unanswerable question from our data, is what happened to increase this behavior and what occurred to change its occurrence, or why was it no longer effective?

The correlograms for Verbal Peer Interactions and Verbal Adult Interactions are essentially similar and indicate that the amount of serial relationship decreases rapidly and effectively disappears after as few as four lags. These data clearly indicate that this child's frequency of interactions fluctuated greatly from day-to-day.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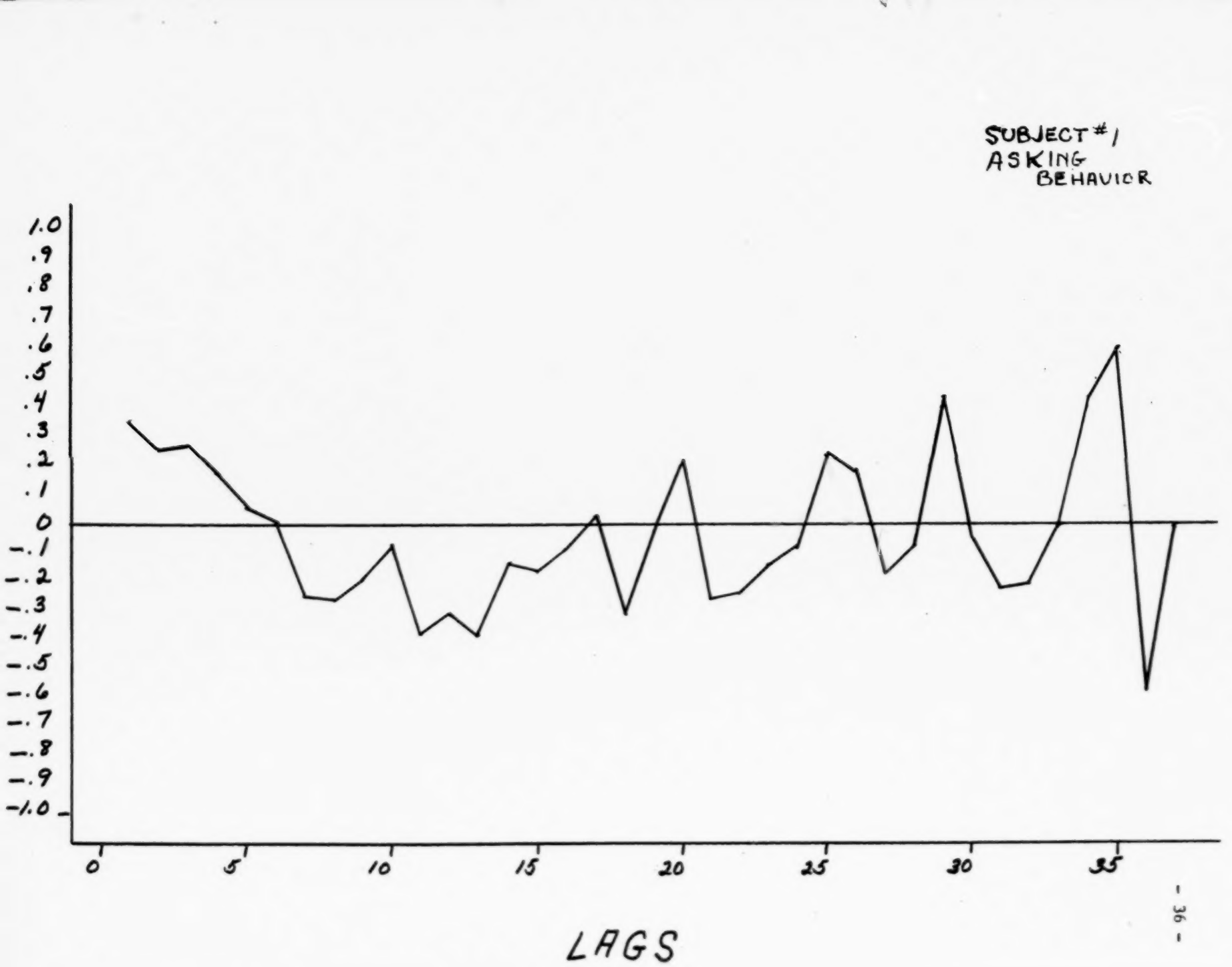
LAGS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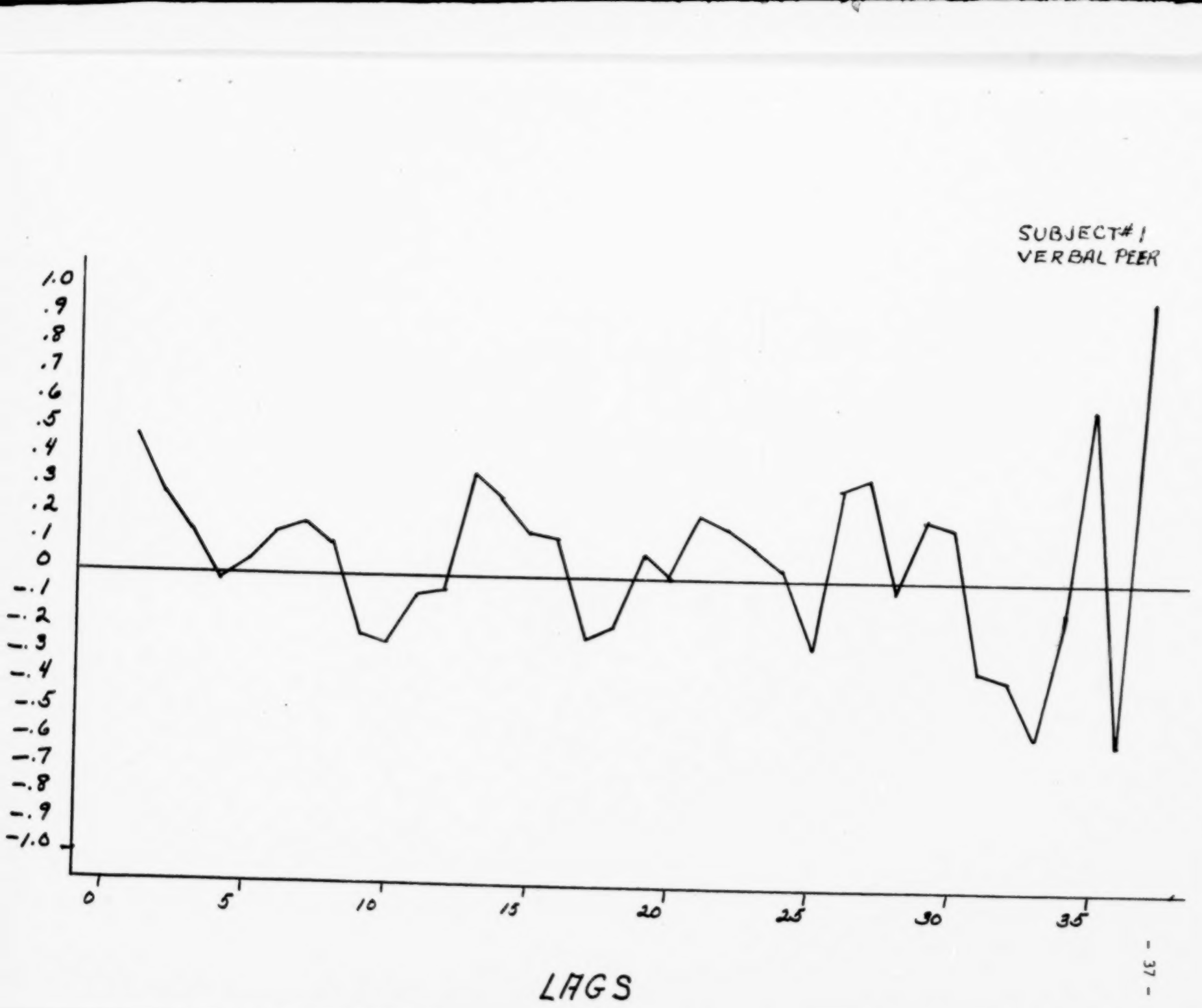
LAGS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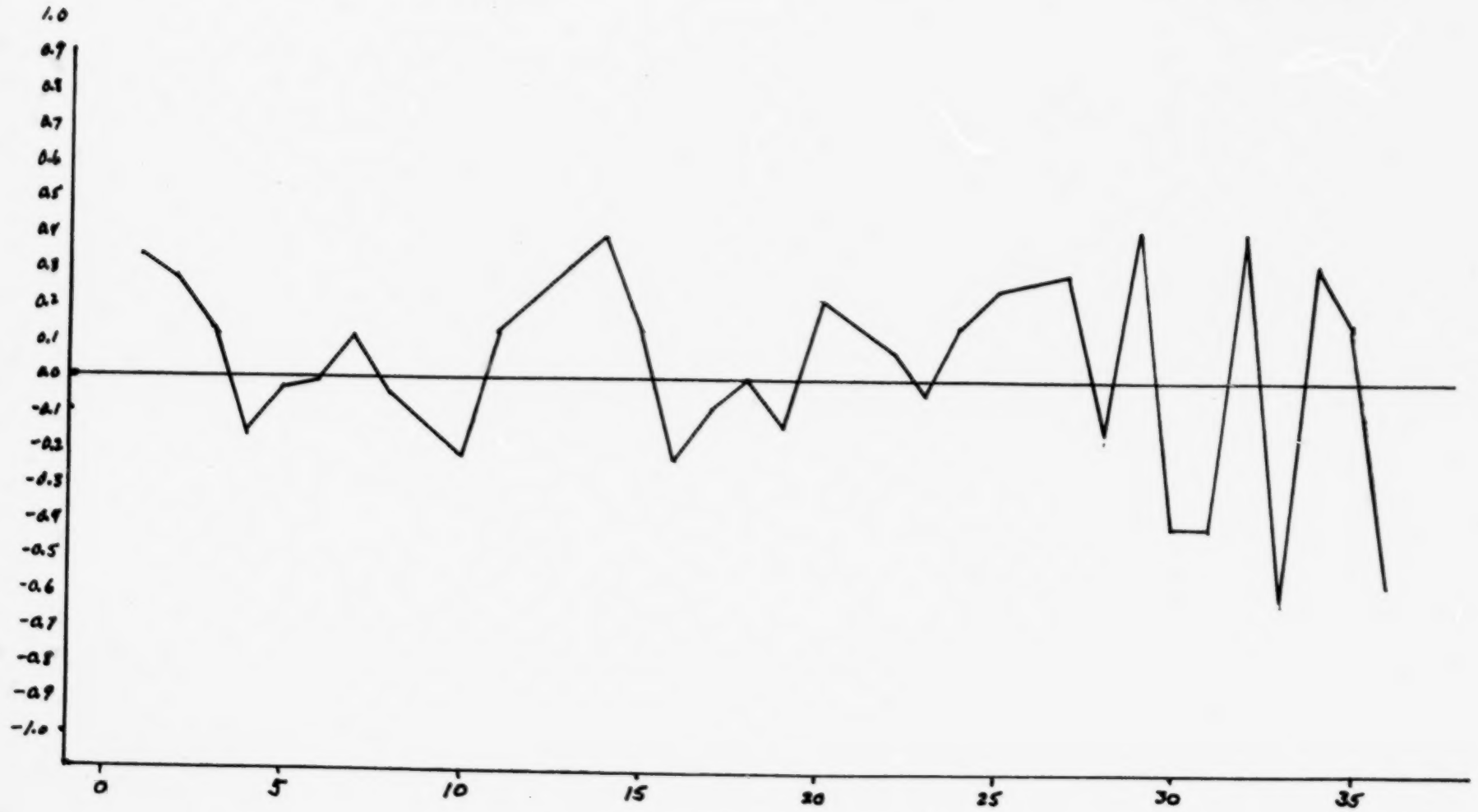
LAGS

SUBJECT #1
VERBAL ADULT



Subject #2. This male child scored second highest on the SB (113) and was among the younger children. His participation in the Active Area was among the highest and his peer and adult interactions were slightly higher than average. Question asking behavior was low.

The correlogram for Active Area participation shows a downward trend from a significant r at lag 1 ($p = .01$) to a zero r at lag six and then reaching a significant r for lags 10 and 11. At lags 21 and 22 the rs are again positive and substantial. These data indicate that there are three points in time during which current behavior is dependent upon earlier behavior but not in the same direction. Inspection of the data suggests that high initial Active Area participation decreases (at approximately the time when the rs become negative) and then increase later in the year. In this case, initial status becomes an important inverse predictor and then a positive predictor. The cyclical nature of these relationships is curious and without any apparent explanation.

The Question Asking behavior of Subject #2 shows a high degree of serial relationship which extends several lags. Beginning with the fifteenth lag and through the seventeenth, the rs reach significance but are negative. For Subject #2 then there is a considerable degree of serial dependence but its direction changes over time. As one might expect, a similar picture exists for Verbal Adult interactions. The same pattern also emerges for Verbal Peer interactions. One might conjecture that for Subject #2, with respect to verbal interactions in general, that some event or set of events occurred during the middle of the year which inhibited his verbal interactions but that later in the year his behavior corresponded more closely to his initial behavior. Again, unfortunately, the data does not provide any clues as to the nature of these events.

SUBJE: - #2
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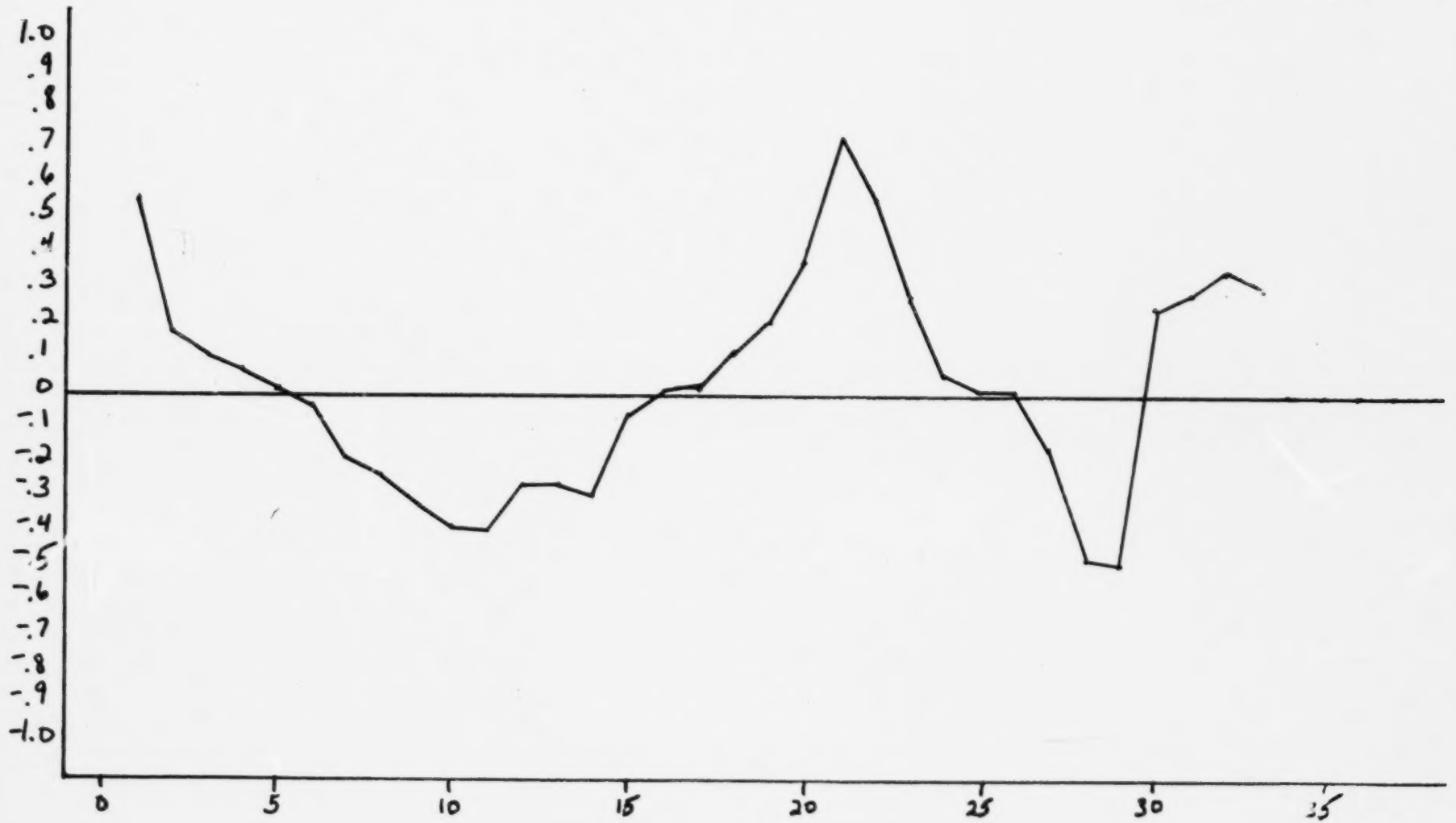

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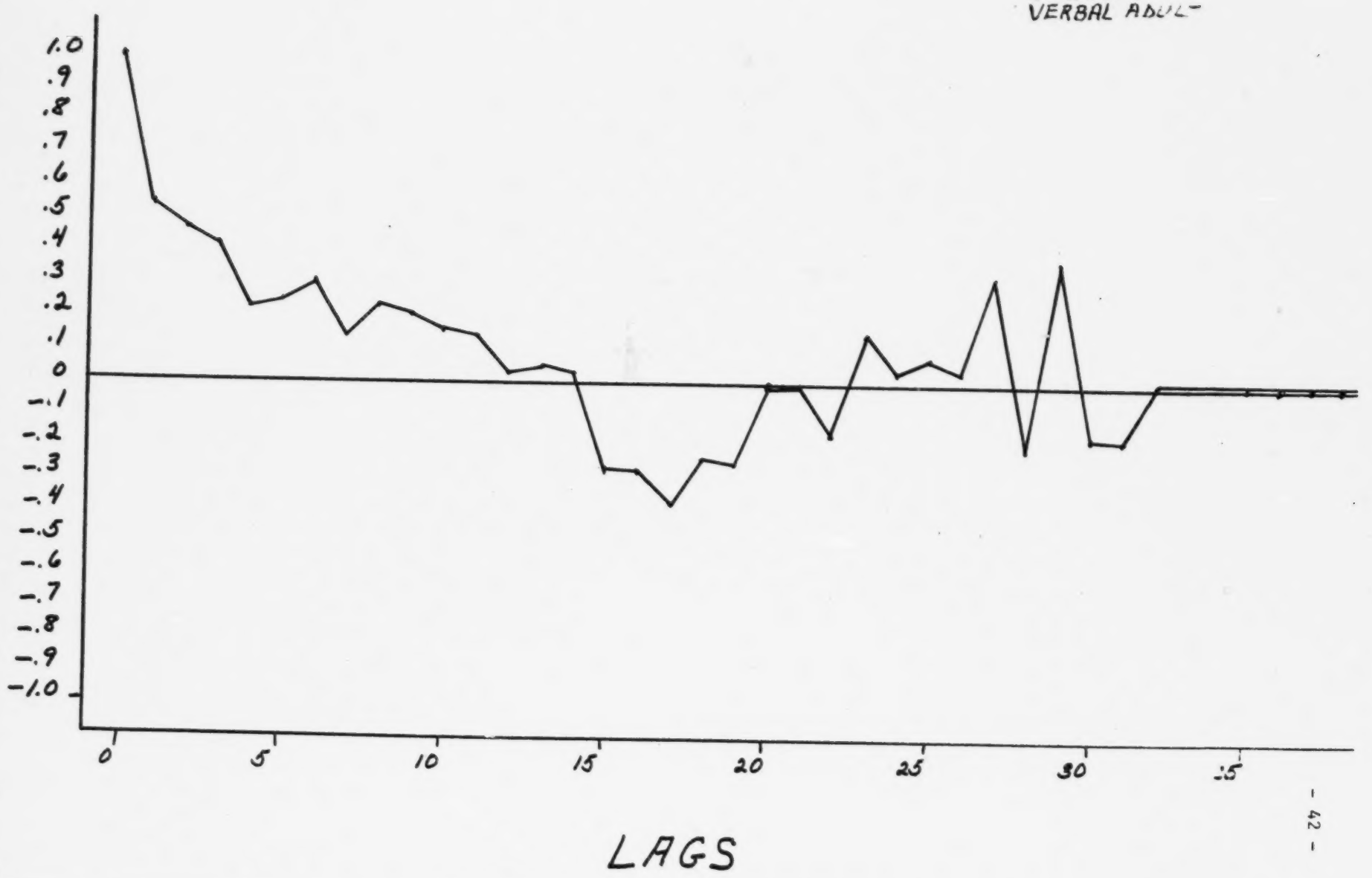
LAGS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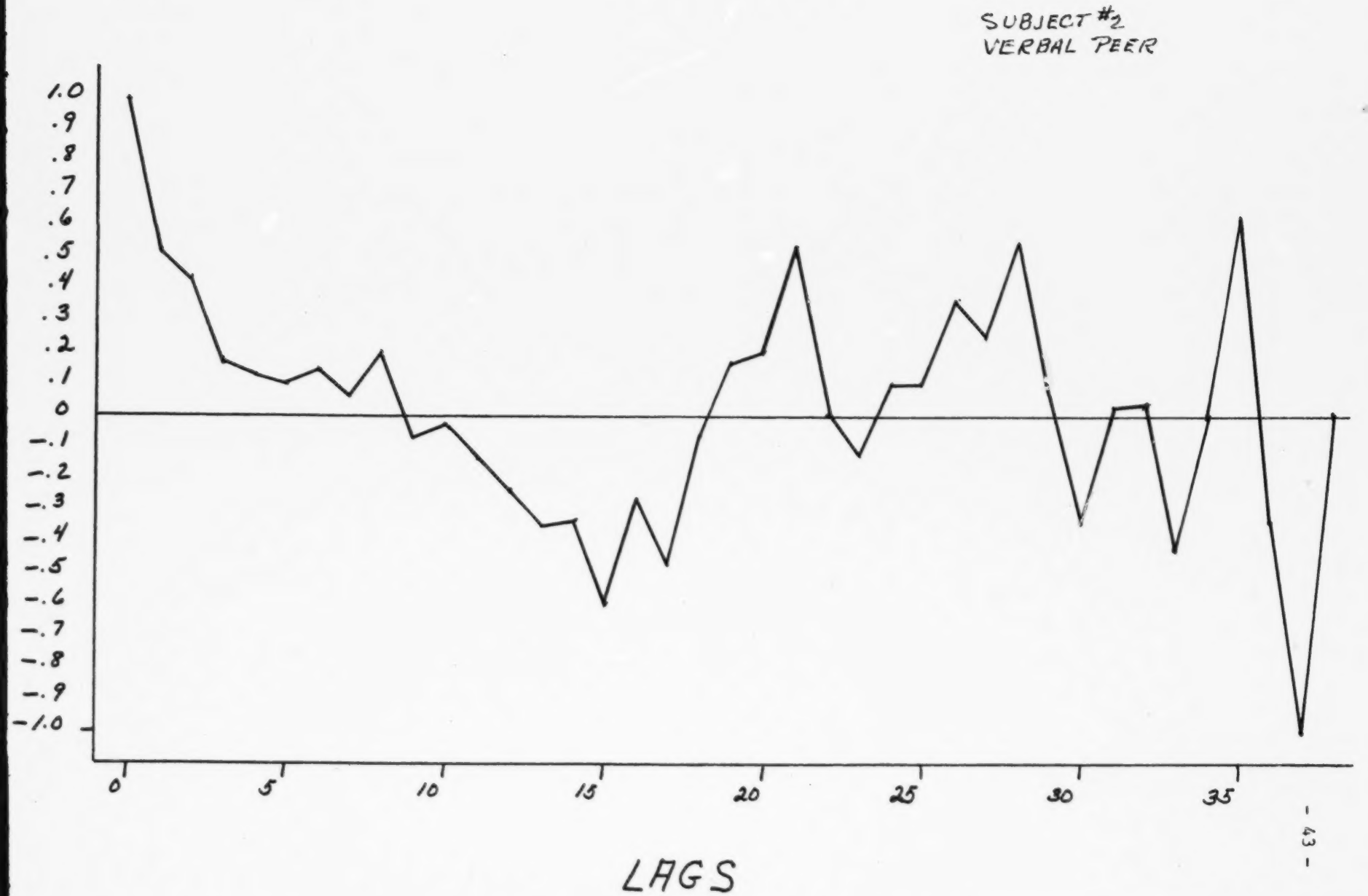
LAGS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-.8
-.9
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0
5
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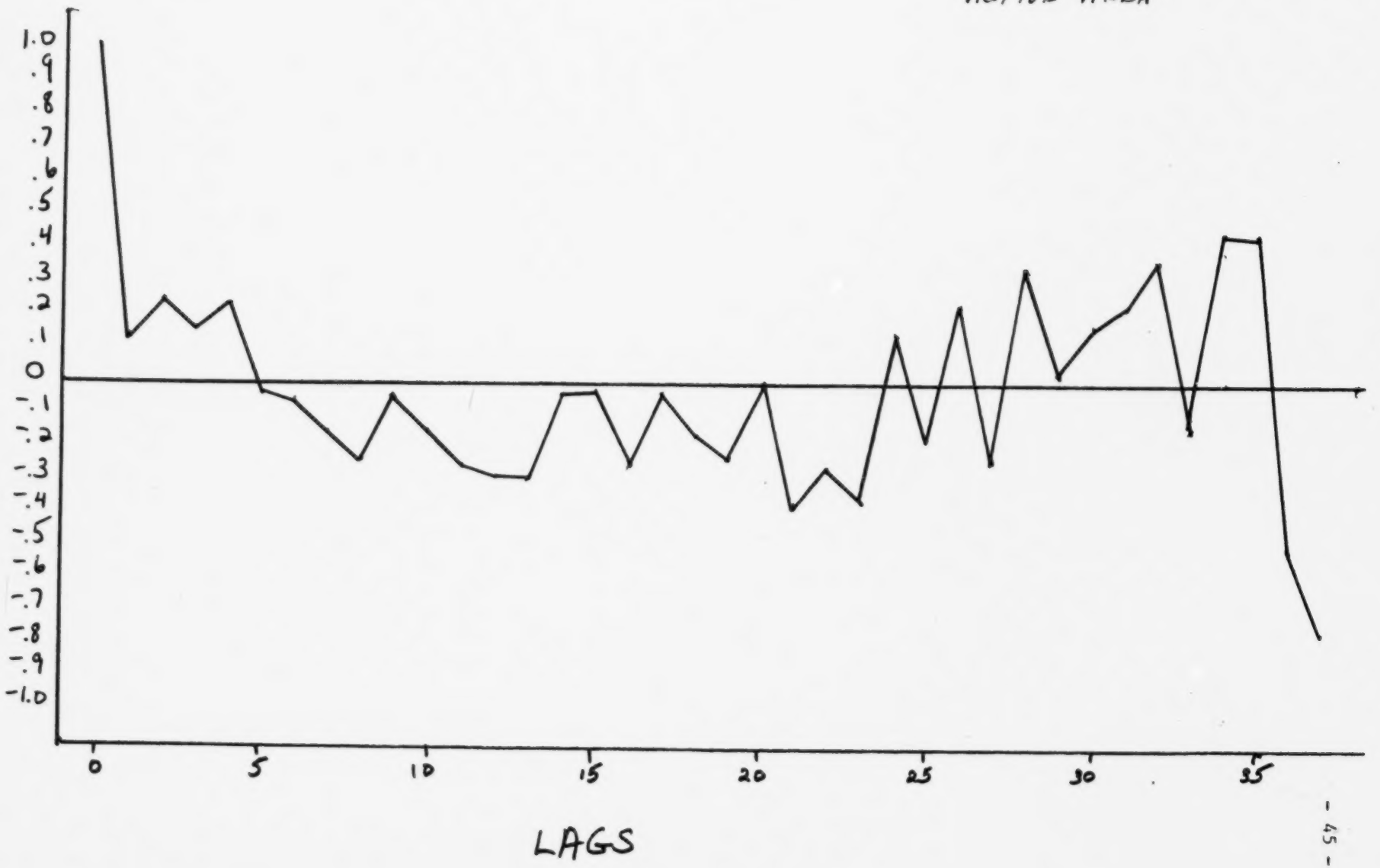
15
20
25
30
35
LAGS

Subject #3. This male child attained an IQ of 103 and is younger than the average child in the sample. He spent relatively less time in the Active Area than his peers, had a low incidence of Question Asking behavior, and a high level of Verbal Peer and Verbal Adult Interactions.

This child's correlogram shows a very rapid drop in serial relationship for the Active Area and the the rs fluctuate around zero. Thus this child's behavior can be best characterized as showing a high degree of fluctuation. Since this pattern is somewhat unique, we examined his data for frequency of participation in the Task and Expressive Areas. It seems that this child distributed his time more equitably across the three areas than any of the other children. What caused this fluctuating behavior is unknown.

Examination of the correlogram for Question Asking behavior shows a high degree of serial dependency which continues over approximately 25 lags. This is a unique pattern which strongly suggests that the child's behavior was not influenced in one way or another by events occurring over time. Thus this child's initial tendencies, low as they may have been, were not effected by the program; stated differently, initial predisposition overcame all other influences. This finding is particularly noteworthy when examined in conjunction with the correlogram for Verbal Adult Interactions. Here, the serial relationship rapidly declines reaching zero by lag 4. It appears that for Subject #3 his general level of Verbal Interactions was influenced by time, but not his questioning behavior.

Finally, the correlogram for Verbal Peer Interactions indicates a high degree of fluctuation with no serial relationship occurring. The total picture for this child is one of relative independence in the sense that his behavior, with one exception, is characterized by considerable fluctuation. The exception, of course, was his proclivity for asking questions of adults.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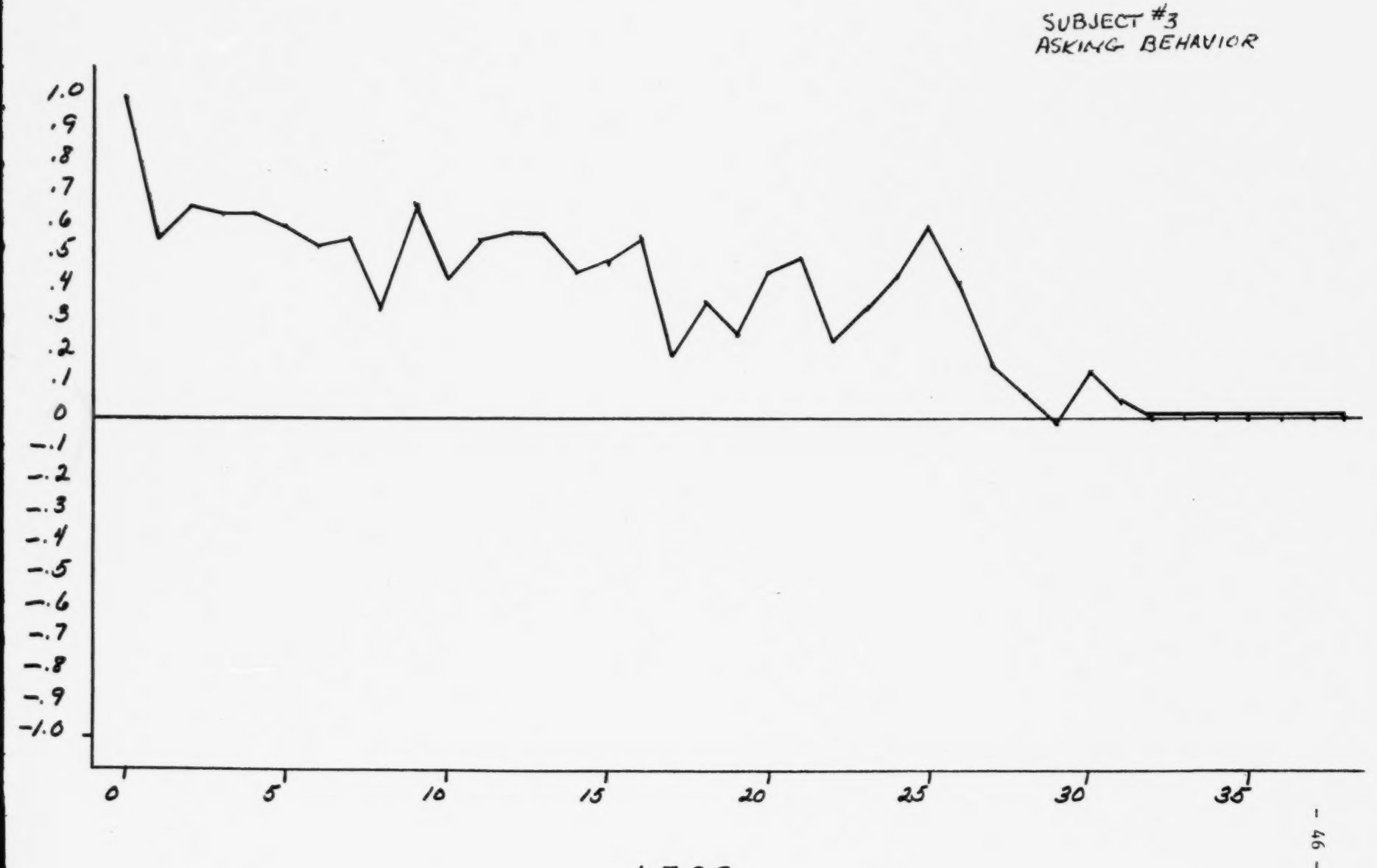
LAGS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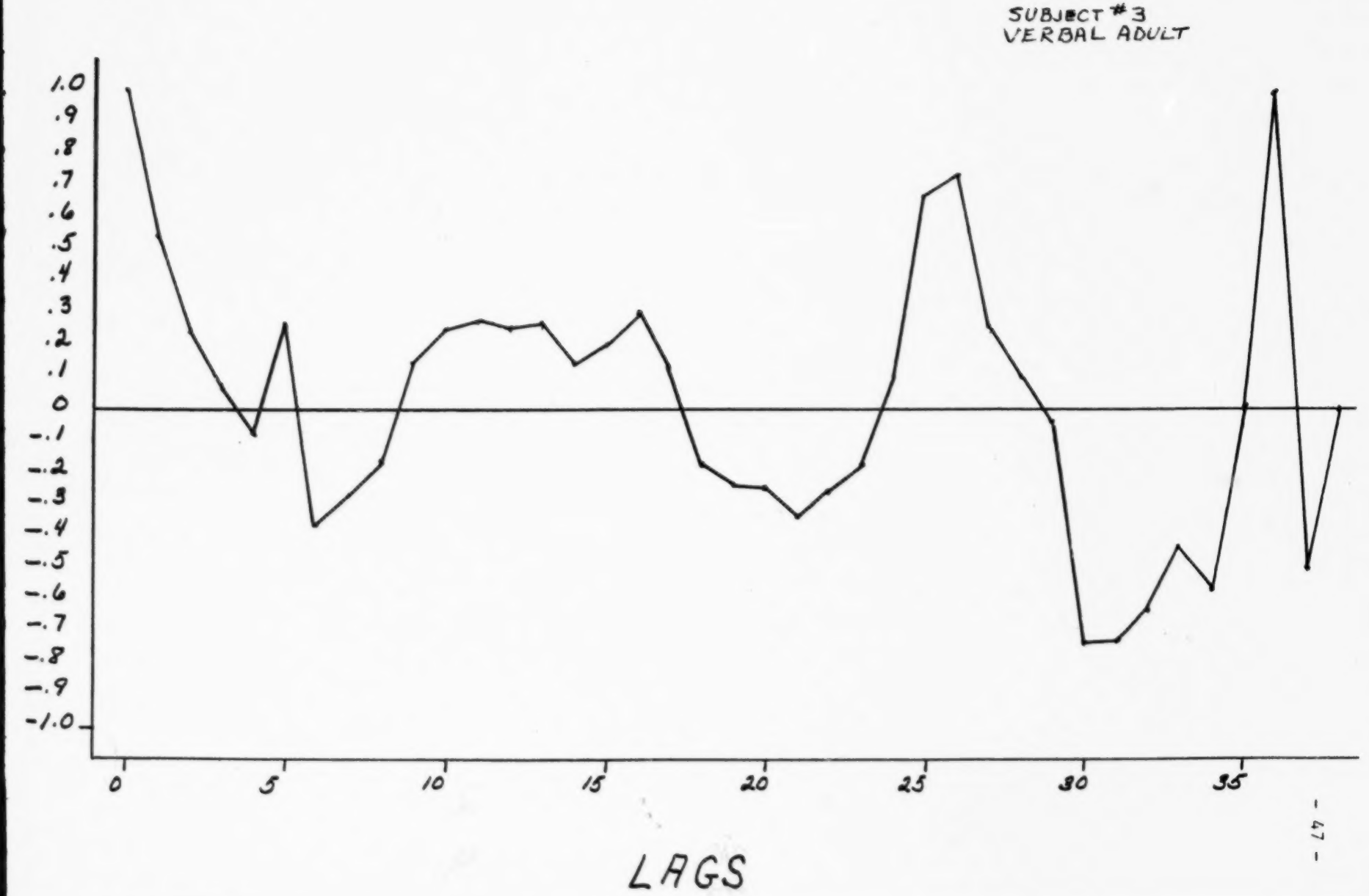
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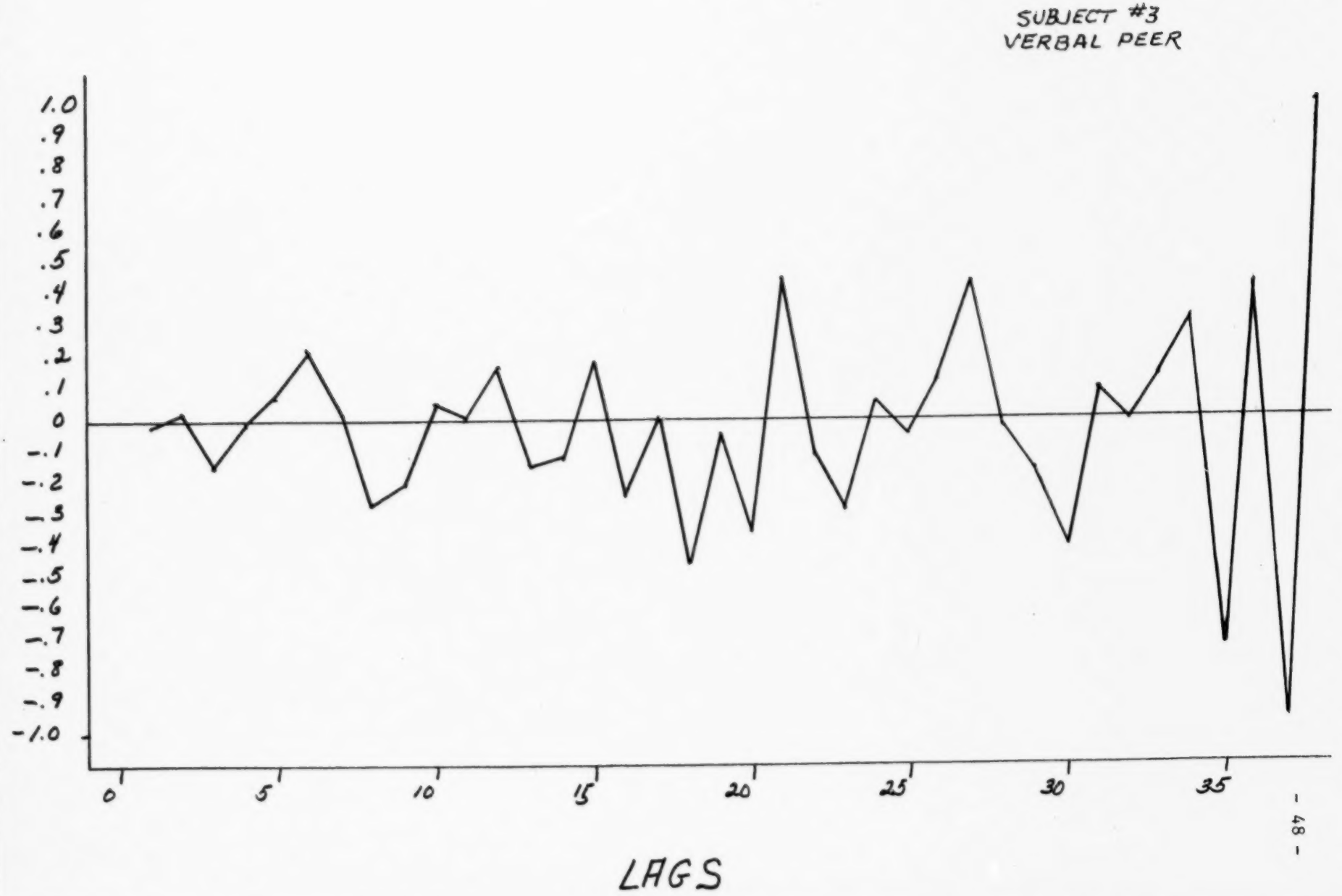
LAGS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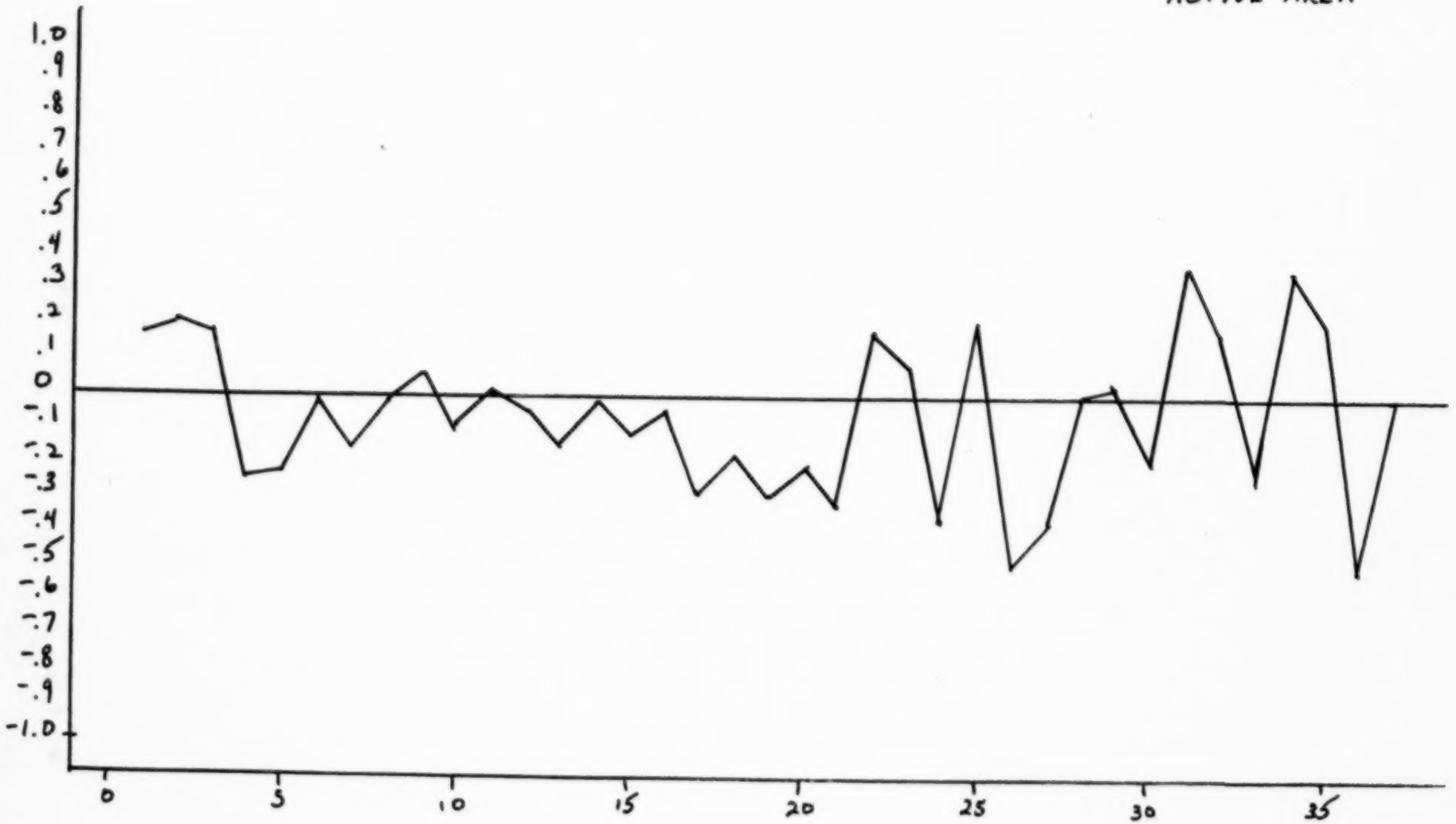
LAGS

The correlograms for the remaining children tend to be somewhat similar so that descriptions of each set of data would be quite repetitious. Thus the material which follows includes a description of the child and his or her correlograms. General comments about the data will be made in the discussion section.

Subject #4. This is a Young male child with average intellectual ability (IQ = 109). His participation in the Active area was low, he had a low incidence of Adult Question Asking, interacted verbally with both peers and adults.

SUBJECT #4
ACTIVE AREA



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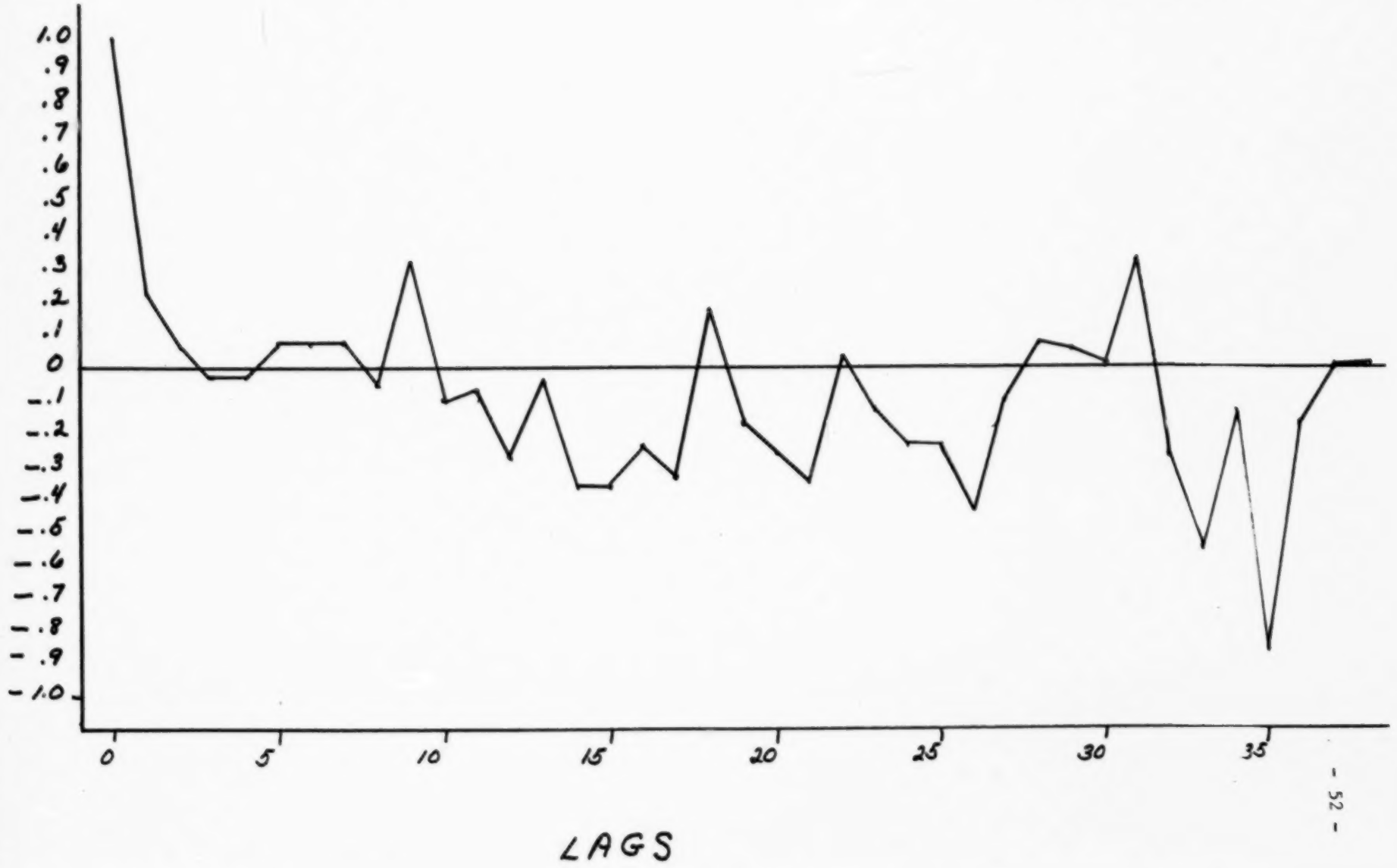
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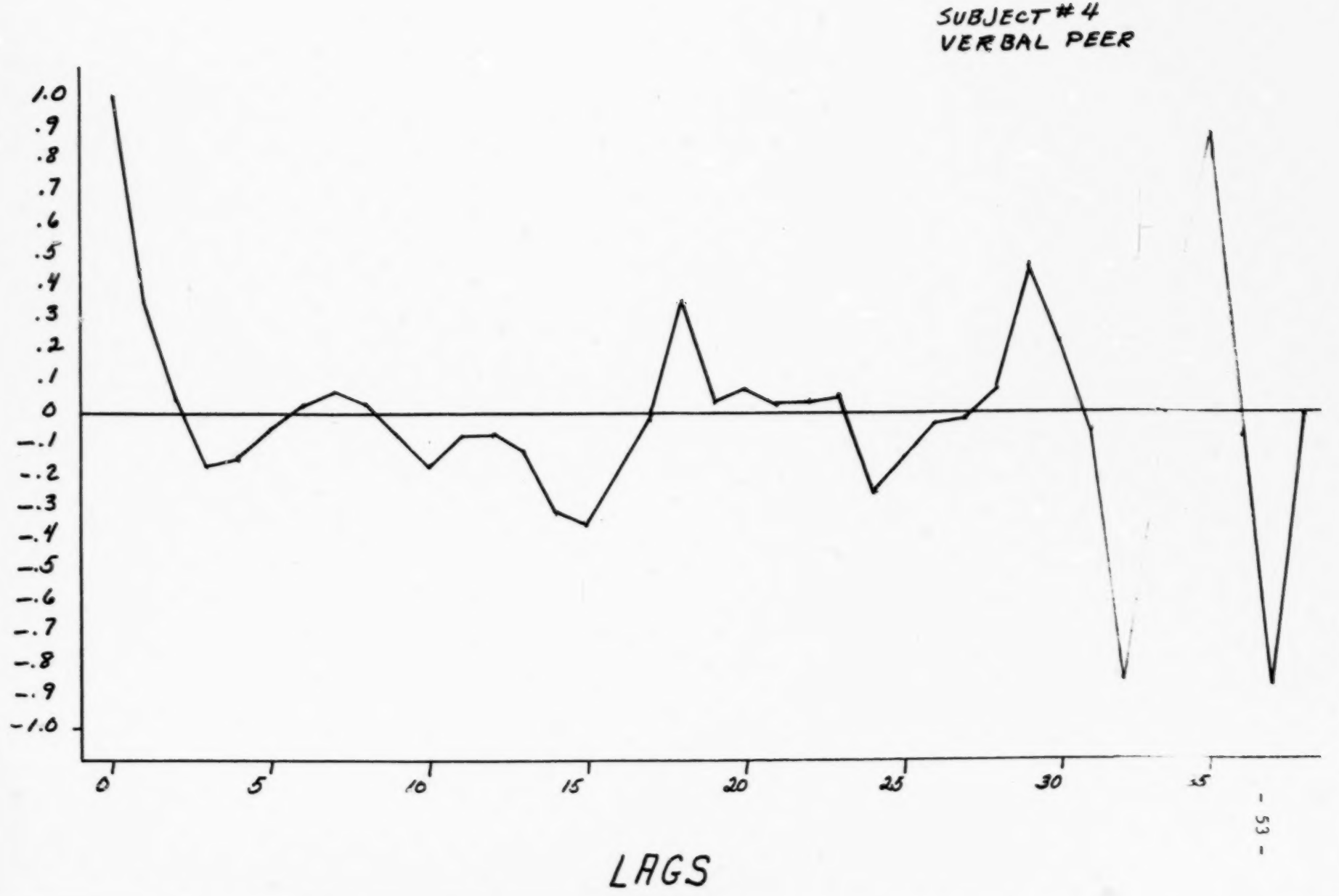
LAGS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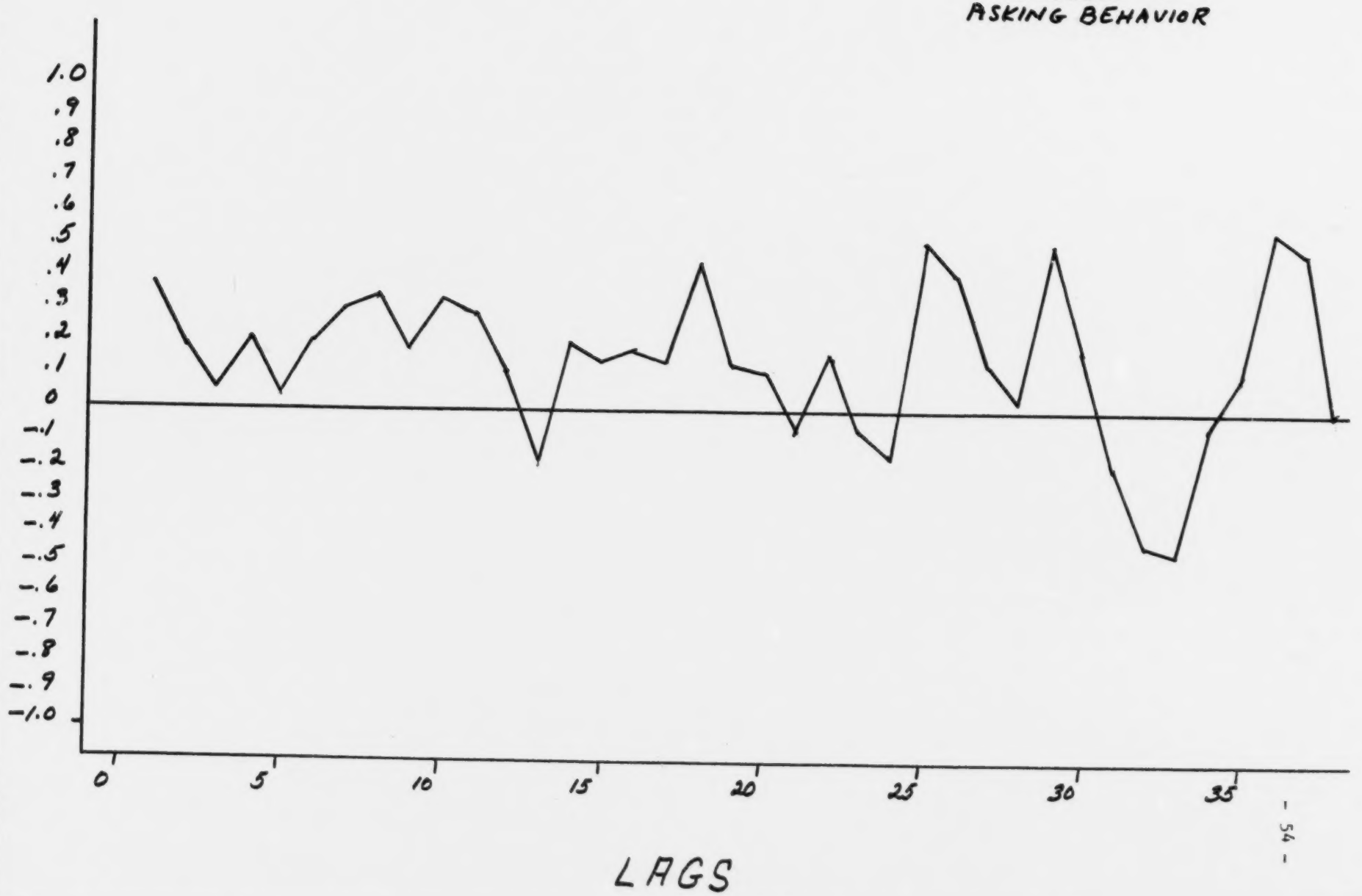
LAGS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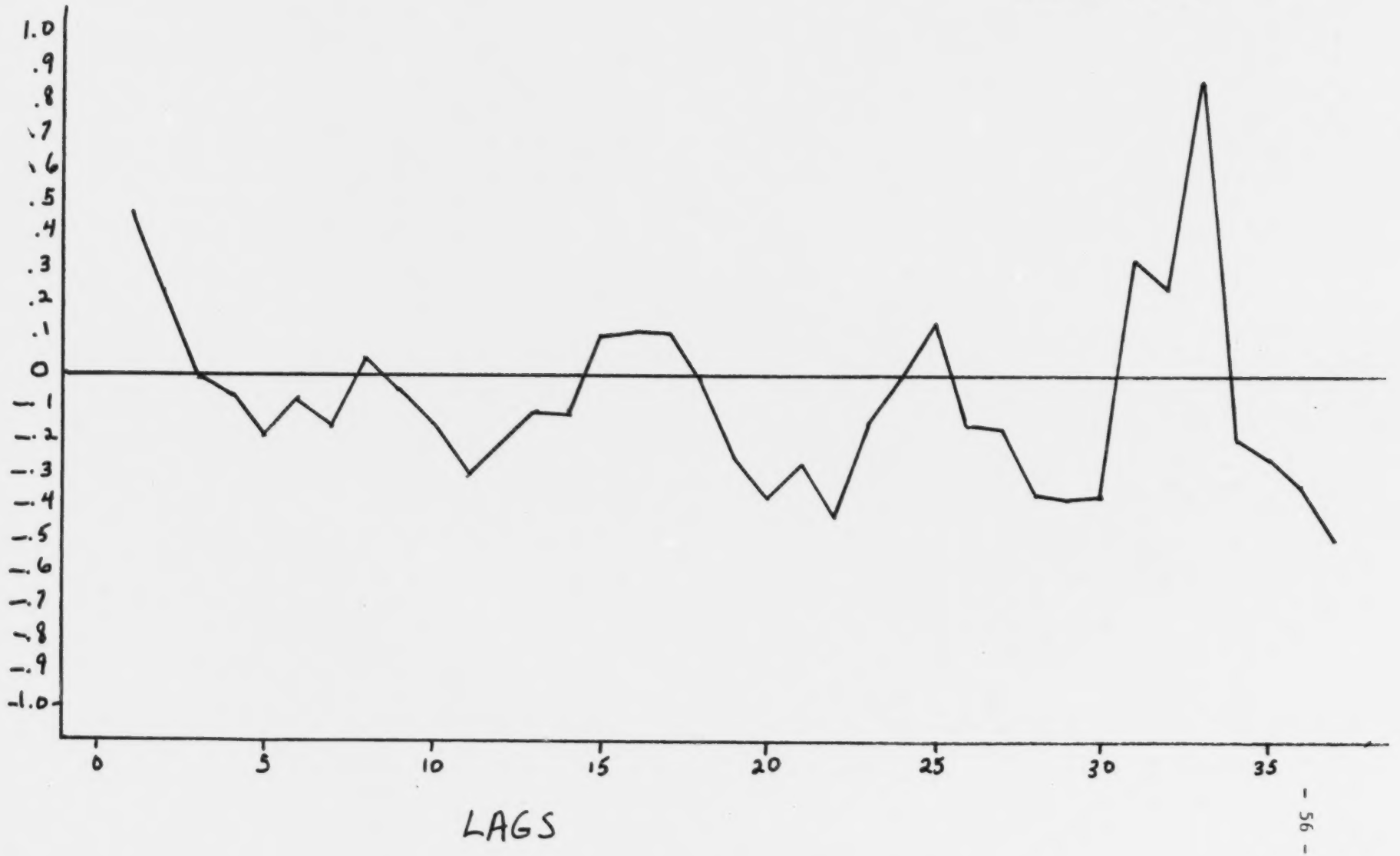
LAGS

Subject #5. This is a boy of slightly below average ability (IQ =96) who is among the older children. He is moderately high in his use of the Active Area, high with respect to both Adult and Peer Verbal Interactions, and asked questions of adults somewhat more frequently than his peers.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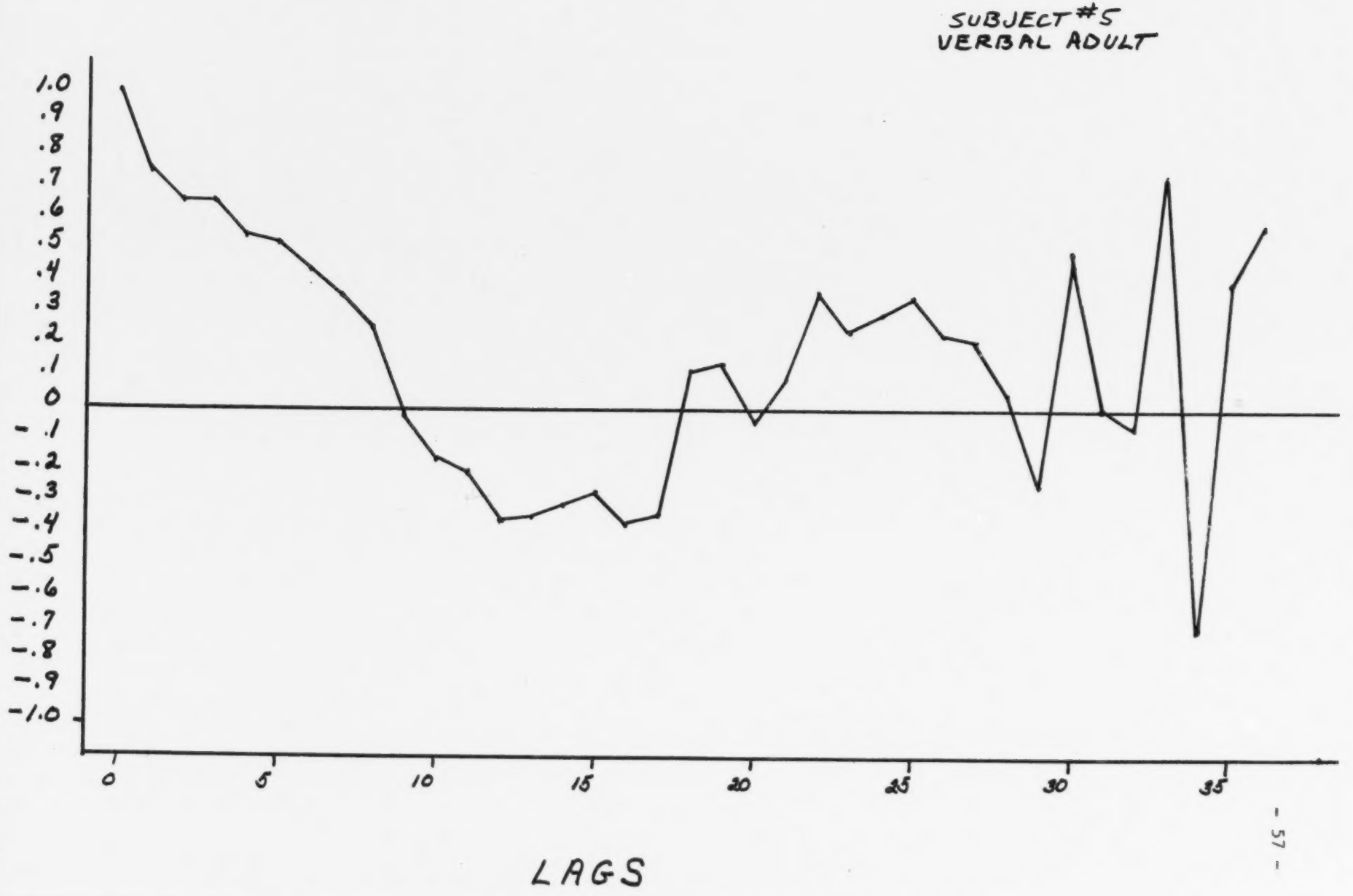
LAGS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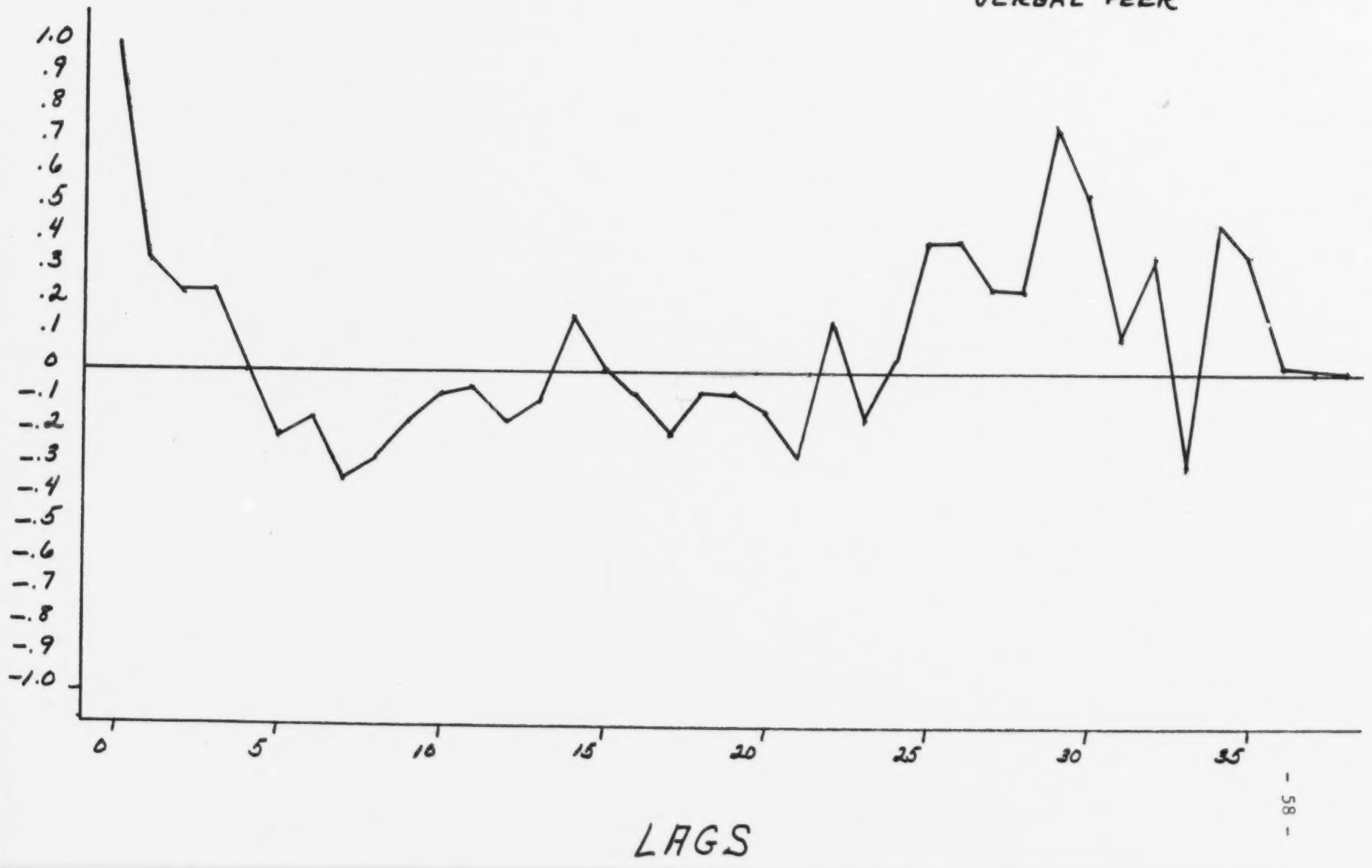
LAGS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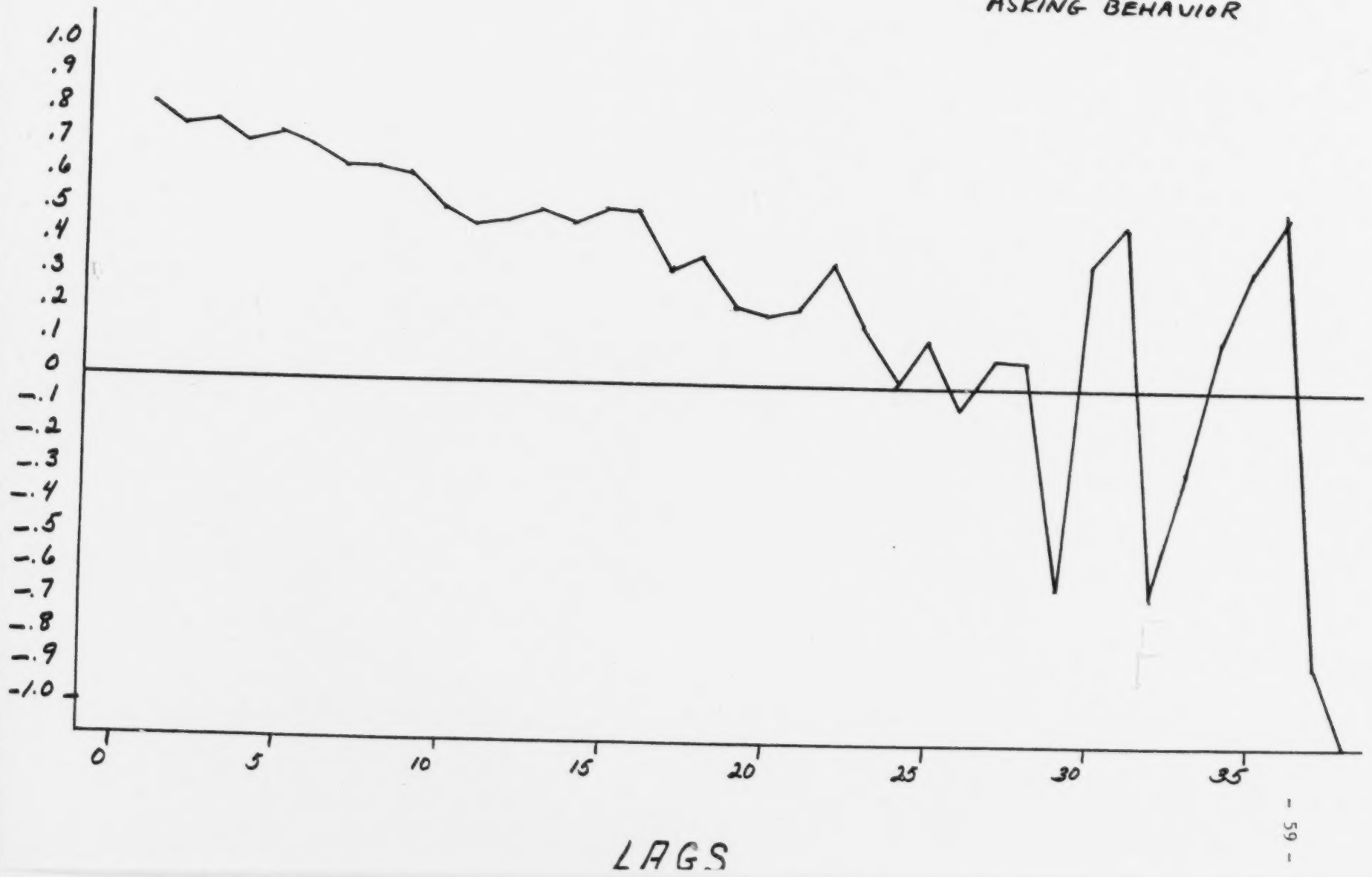
LAGS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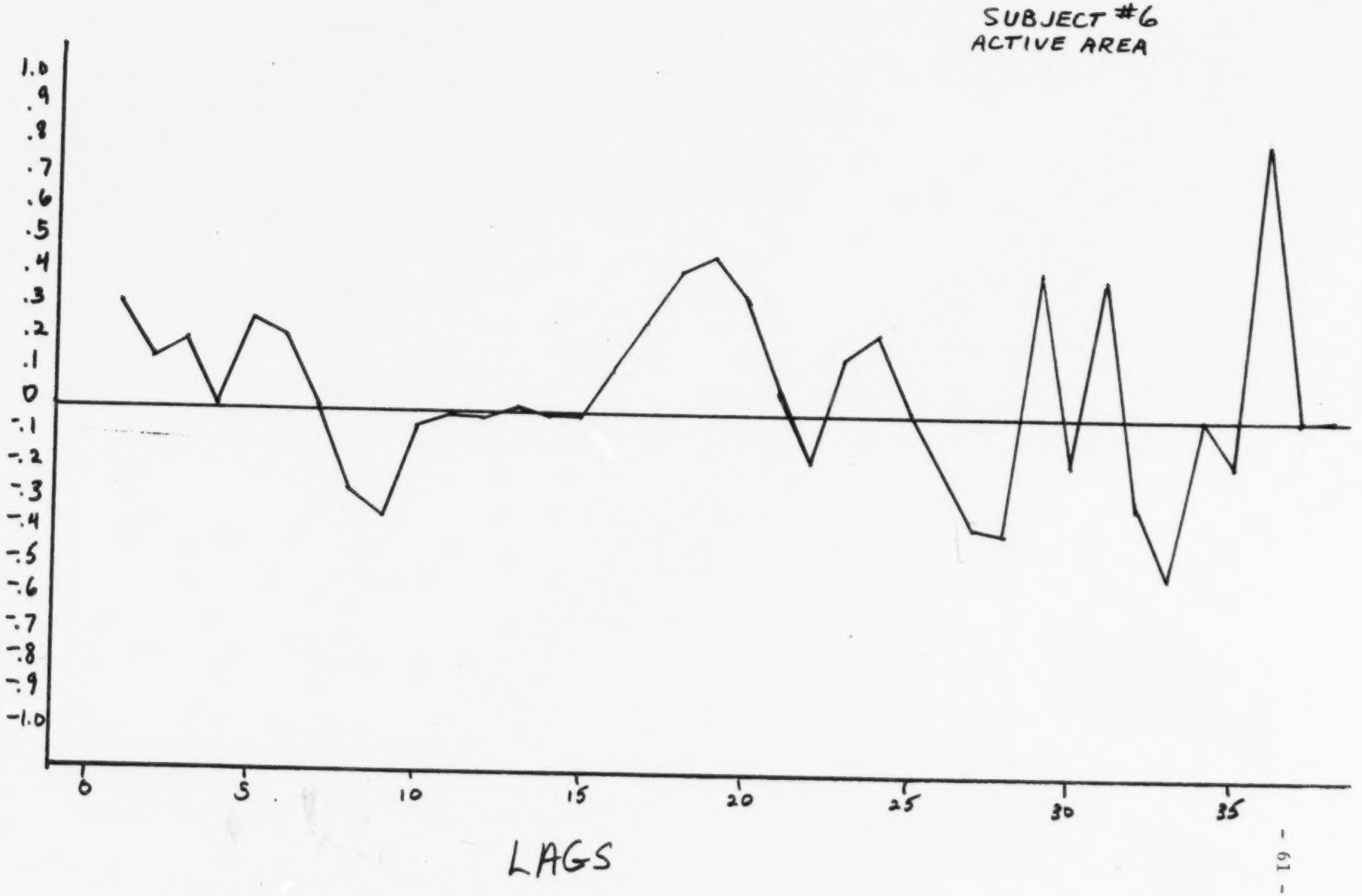
LAGS

Subject #6. This male child has an IQ score of 94 and is among those children who used the Active Area very frequently. He is older than the average child who interacted verbally with his peers and with adults relatively infrequently. His question asking behavior was relatively limited.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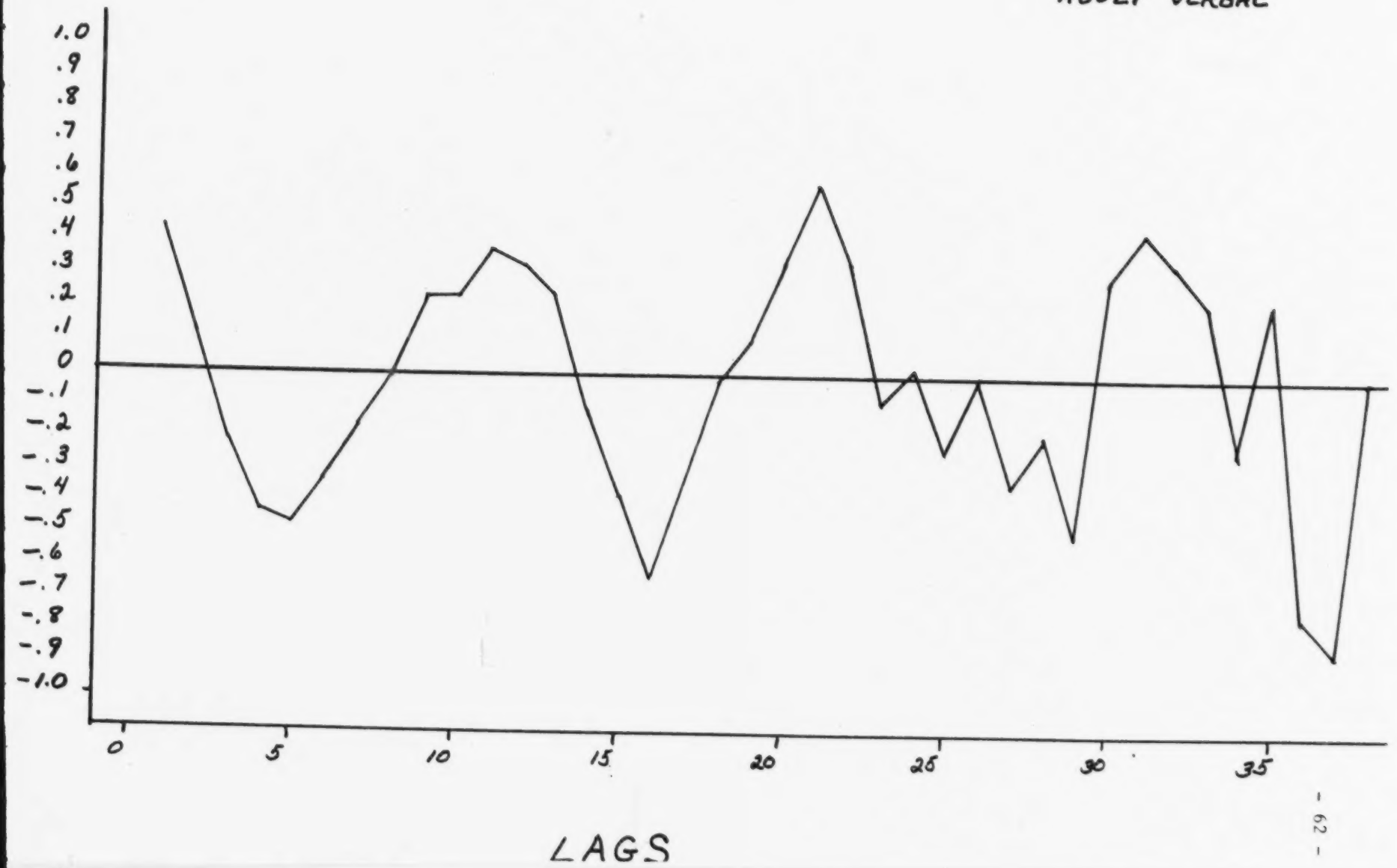
LAGS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LAGS

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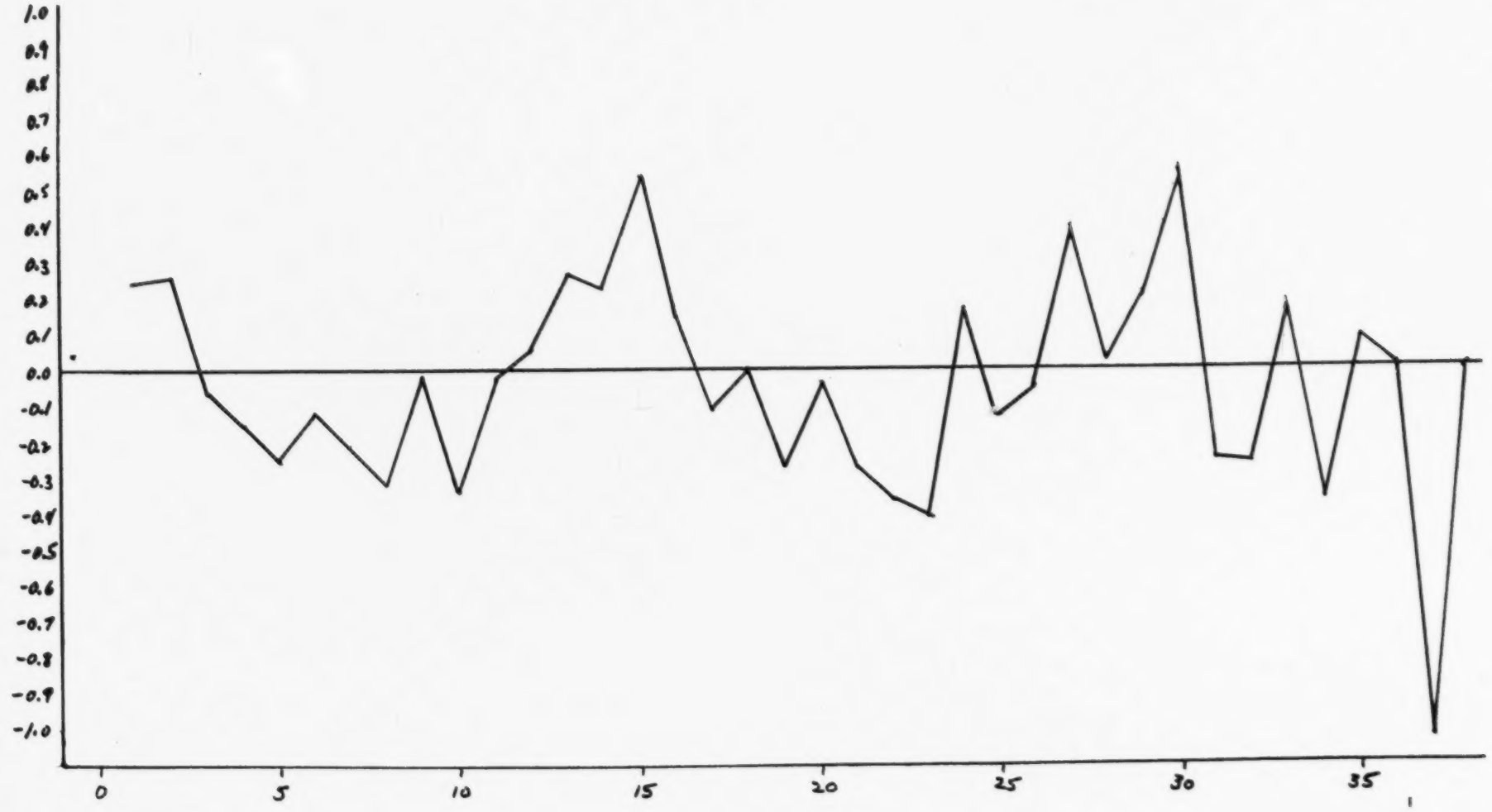

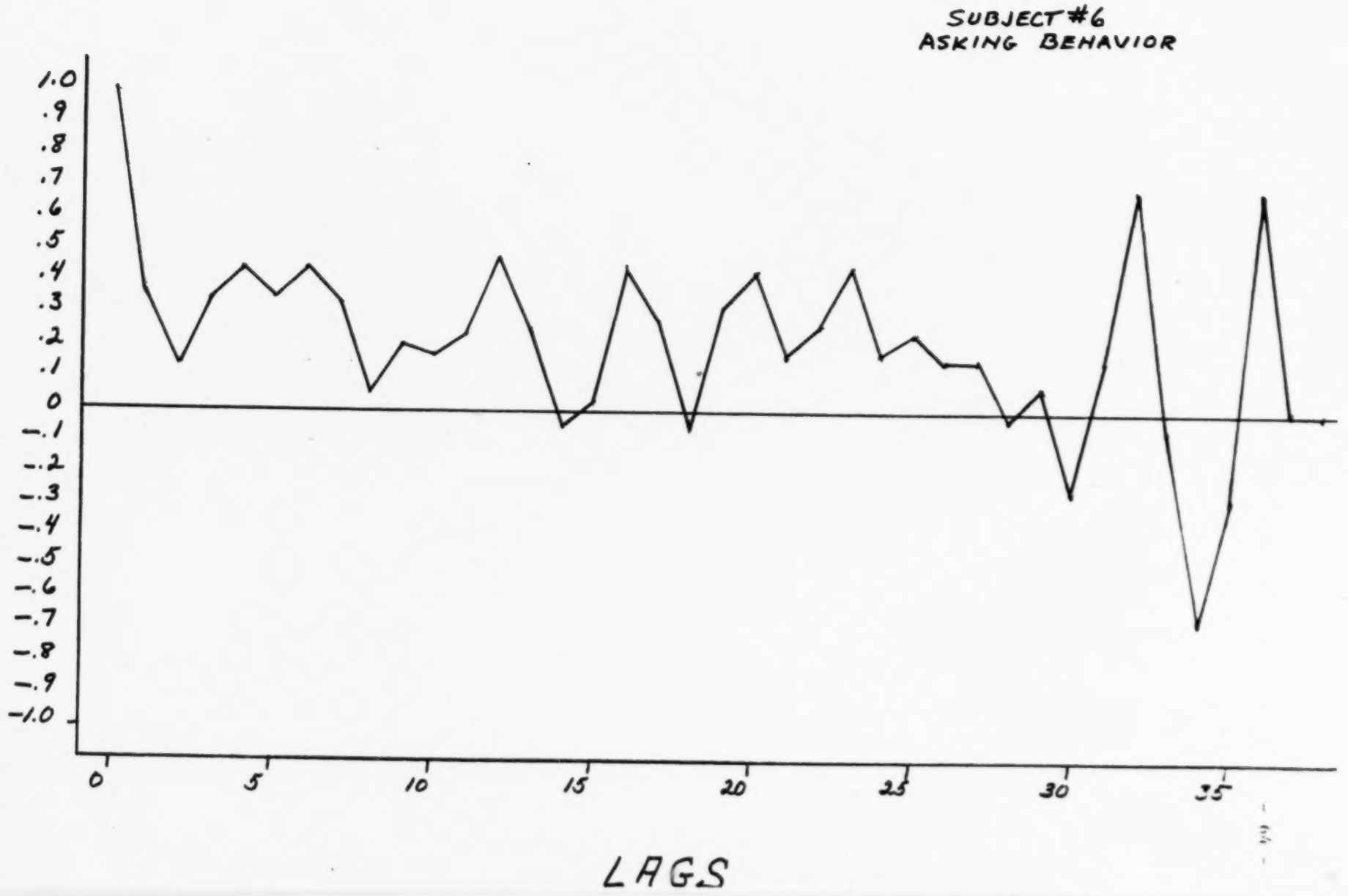
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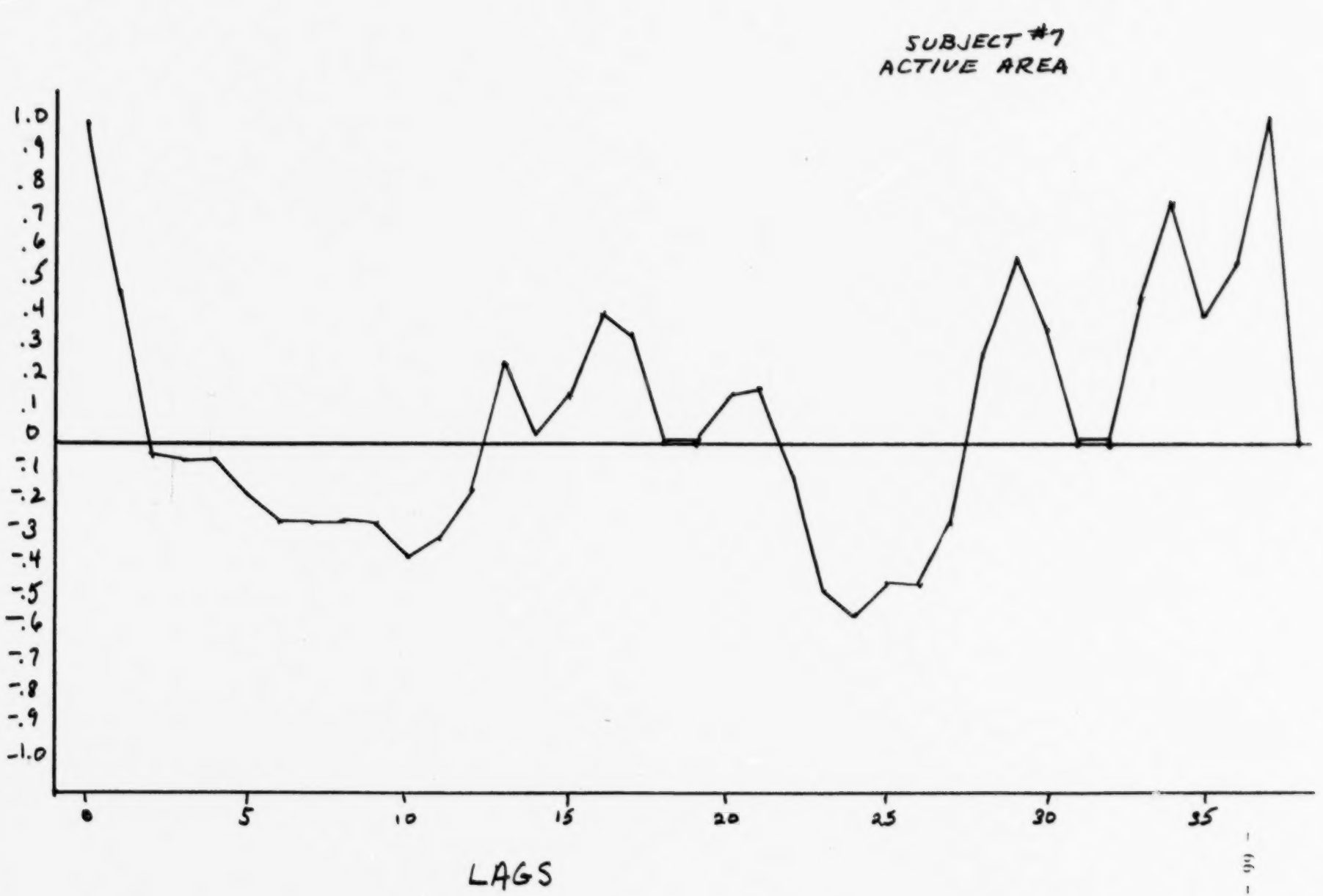
LAGS

Subject #7. This is a bright (IQ = 121) older female child who used the Active Area rather frequently. Her frequency of question asking behavior was relatively low as were the number of verbal interactions with adults. She interacted at a rather high frequency with her peers.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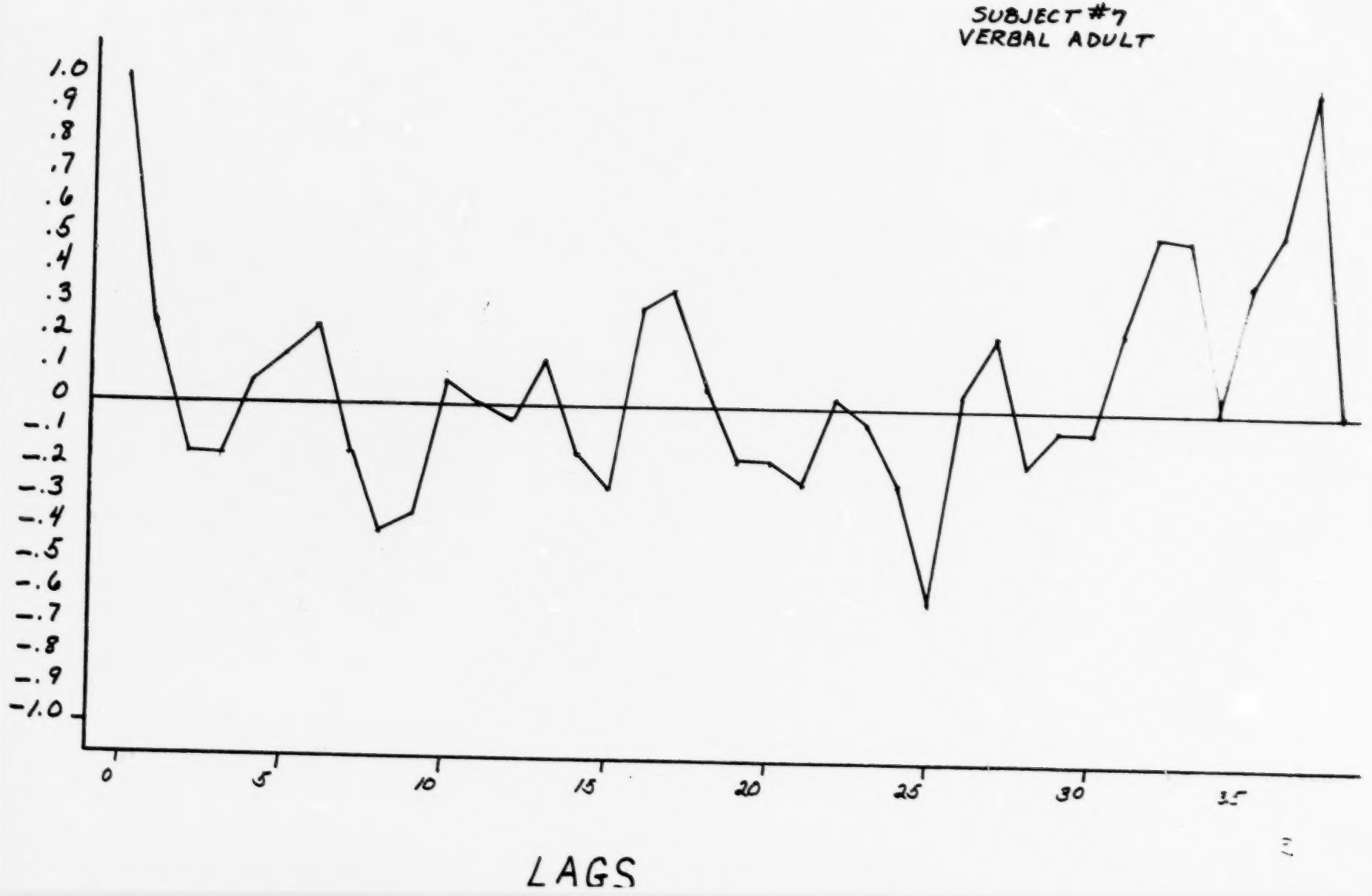
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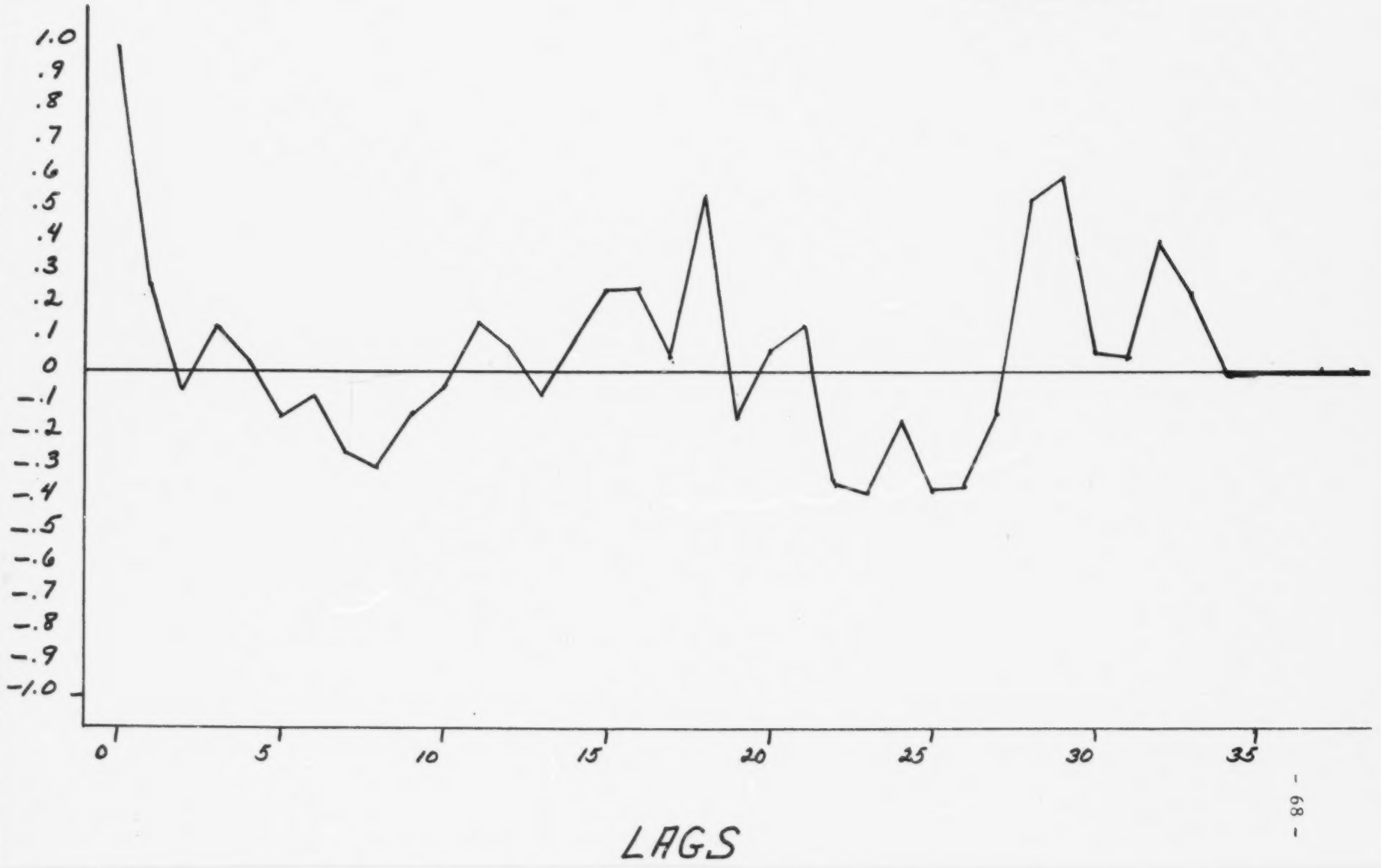
LAGS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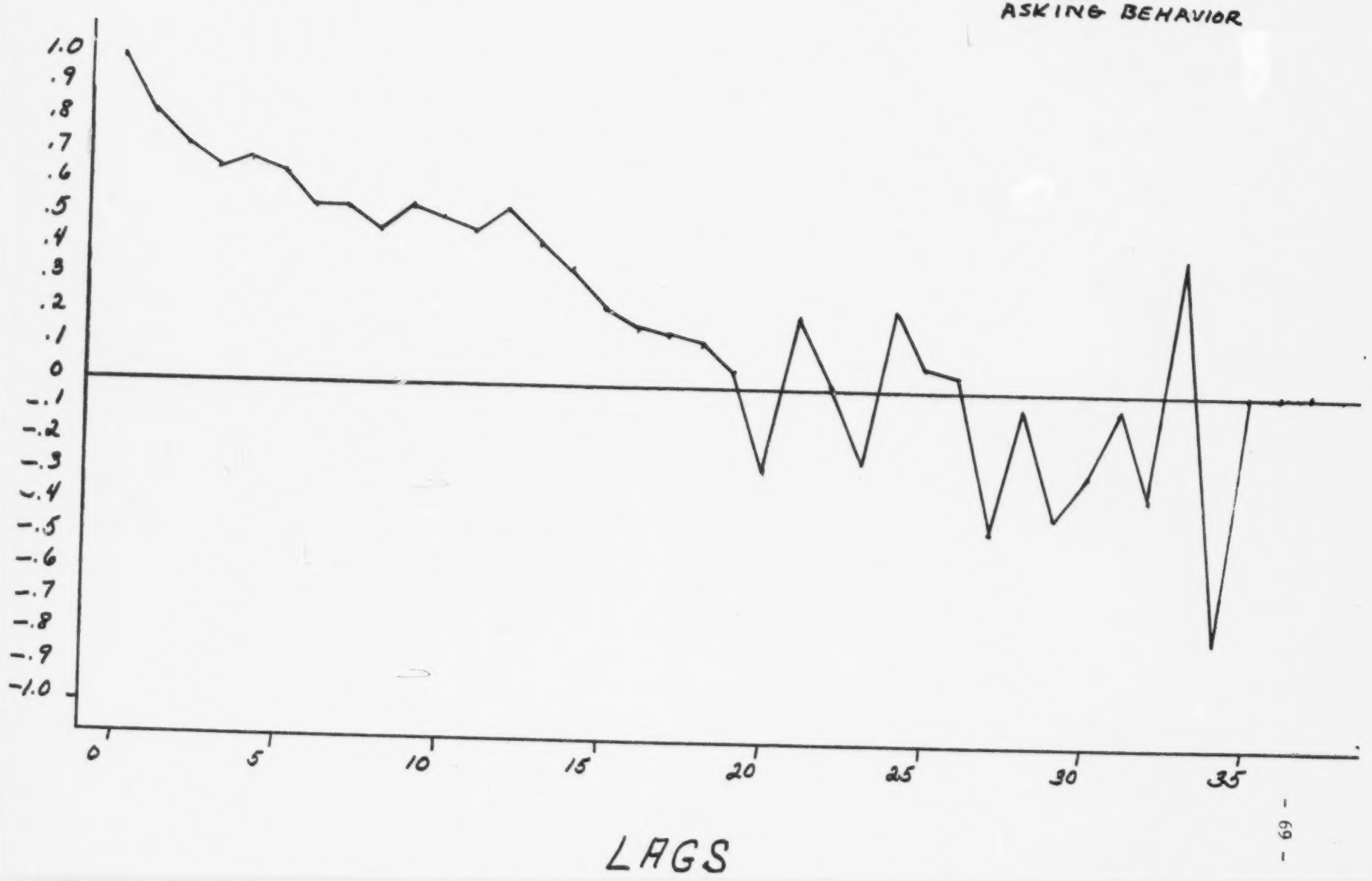
LAGS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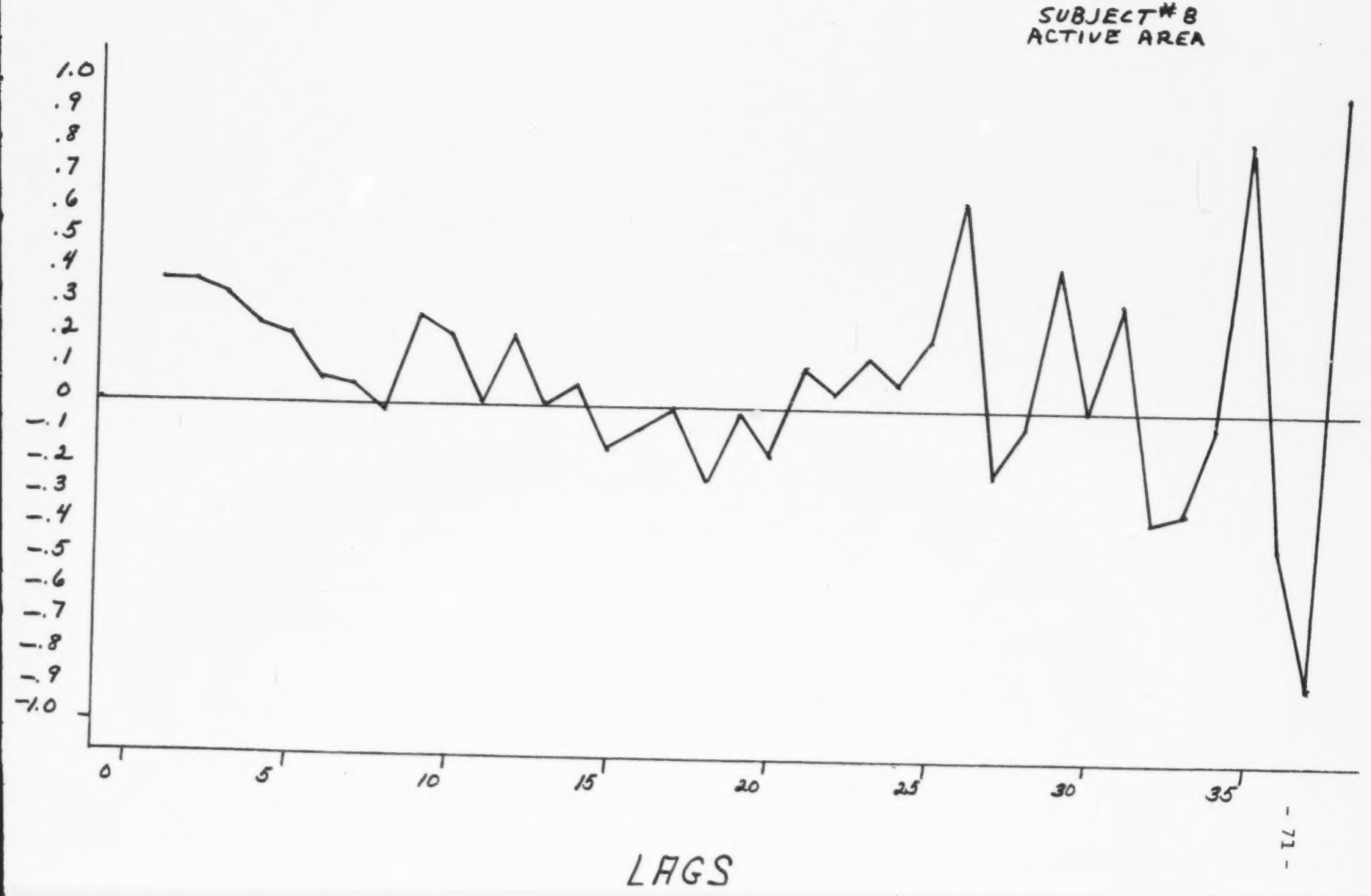
LAGS

Subject #8. This child scored very high on the SB (IQ = 134) and she is also among the older children in the sample. Her participation in the Active Area was high as was the frequency of Verbal Interactions with Peers and Adults. She did not ask questions of adults very often.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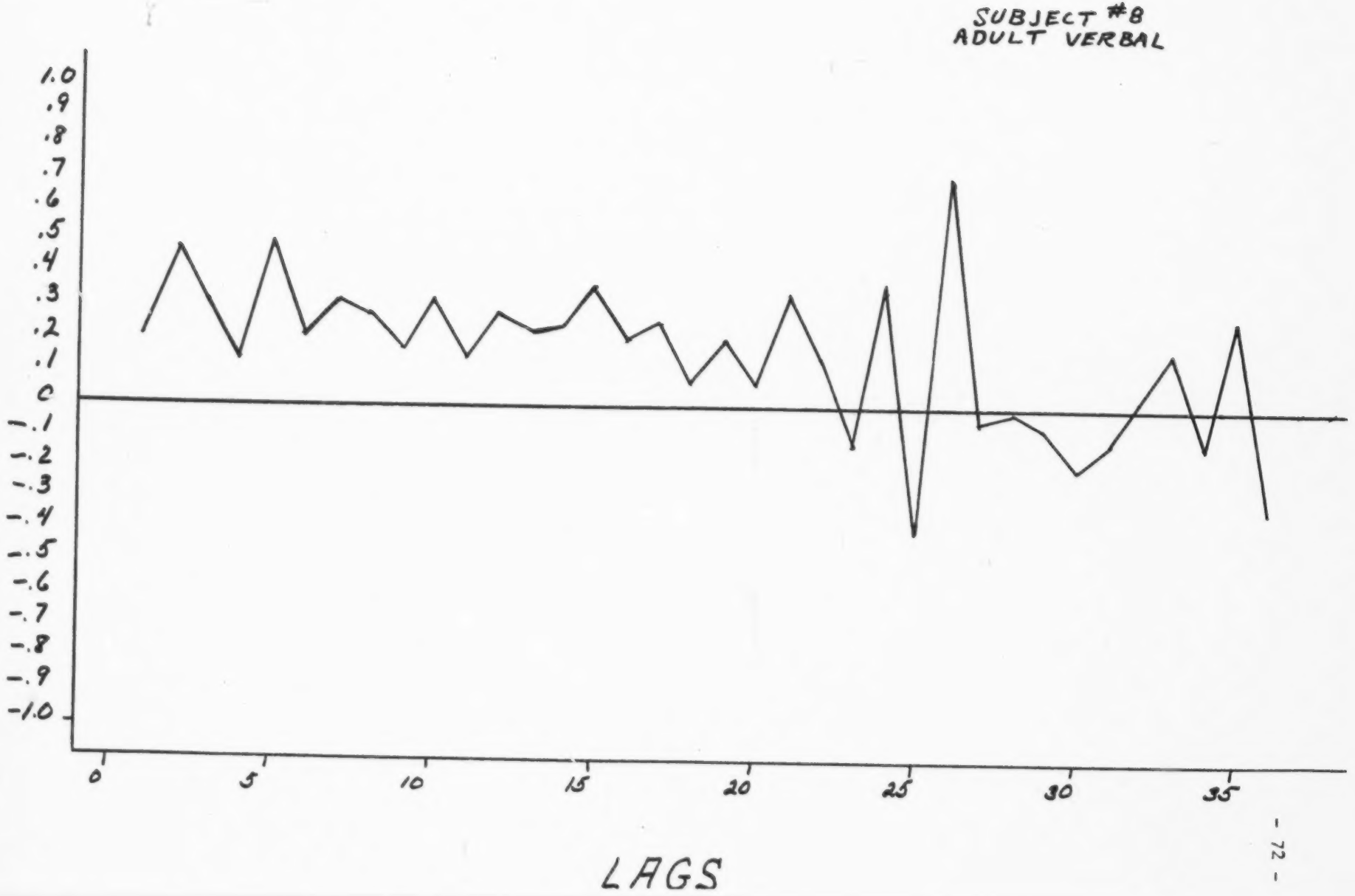
LAGS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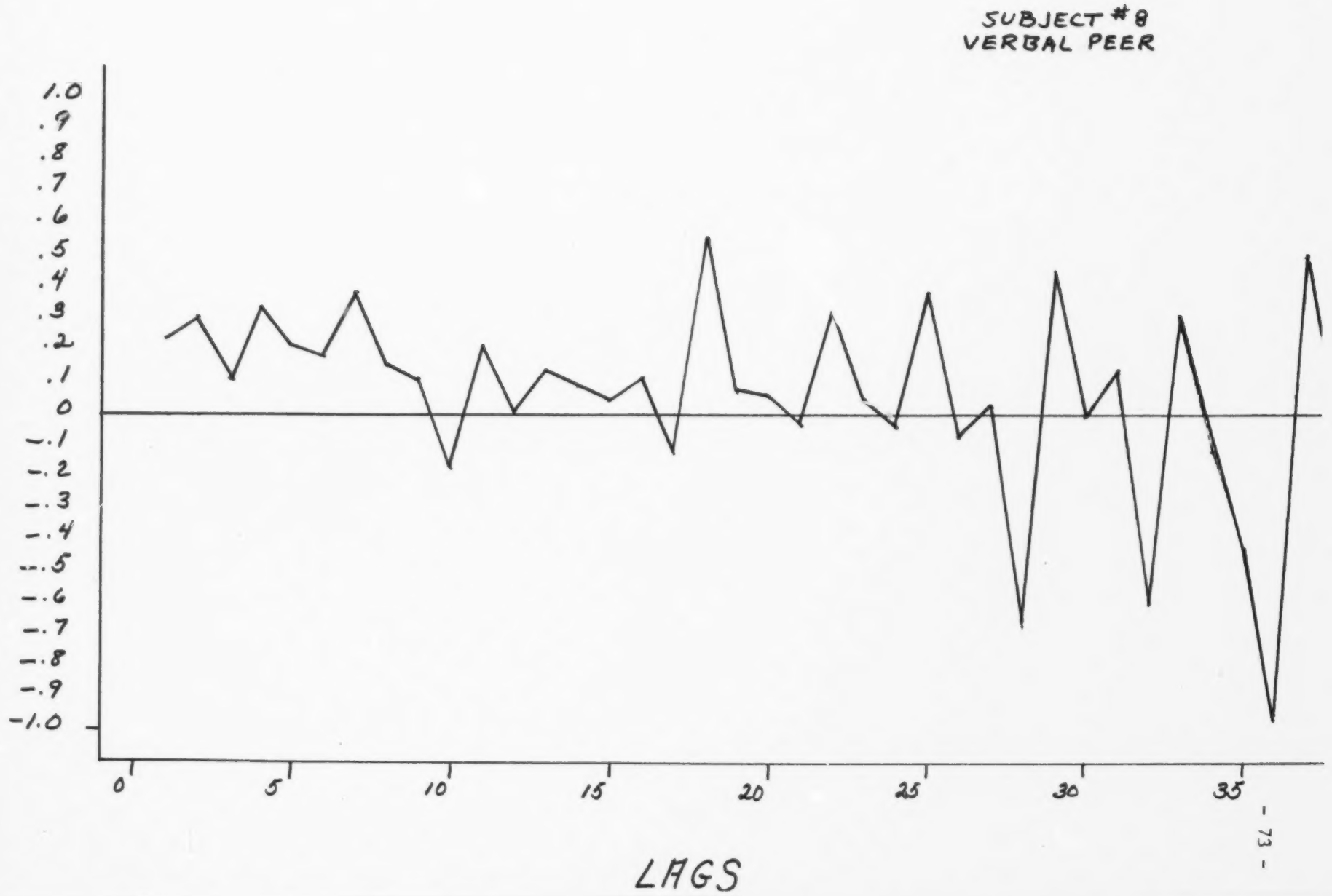
LAGS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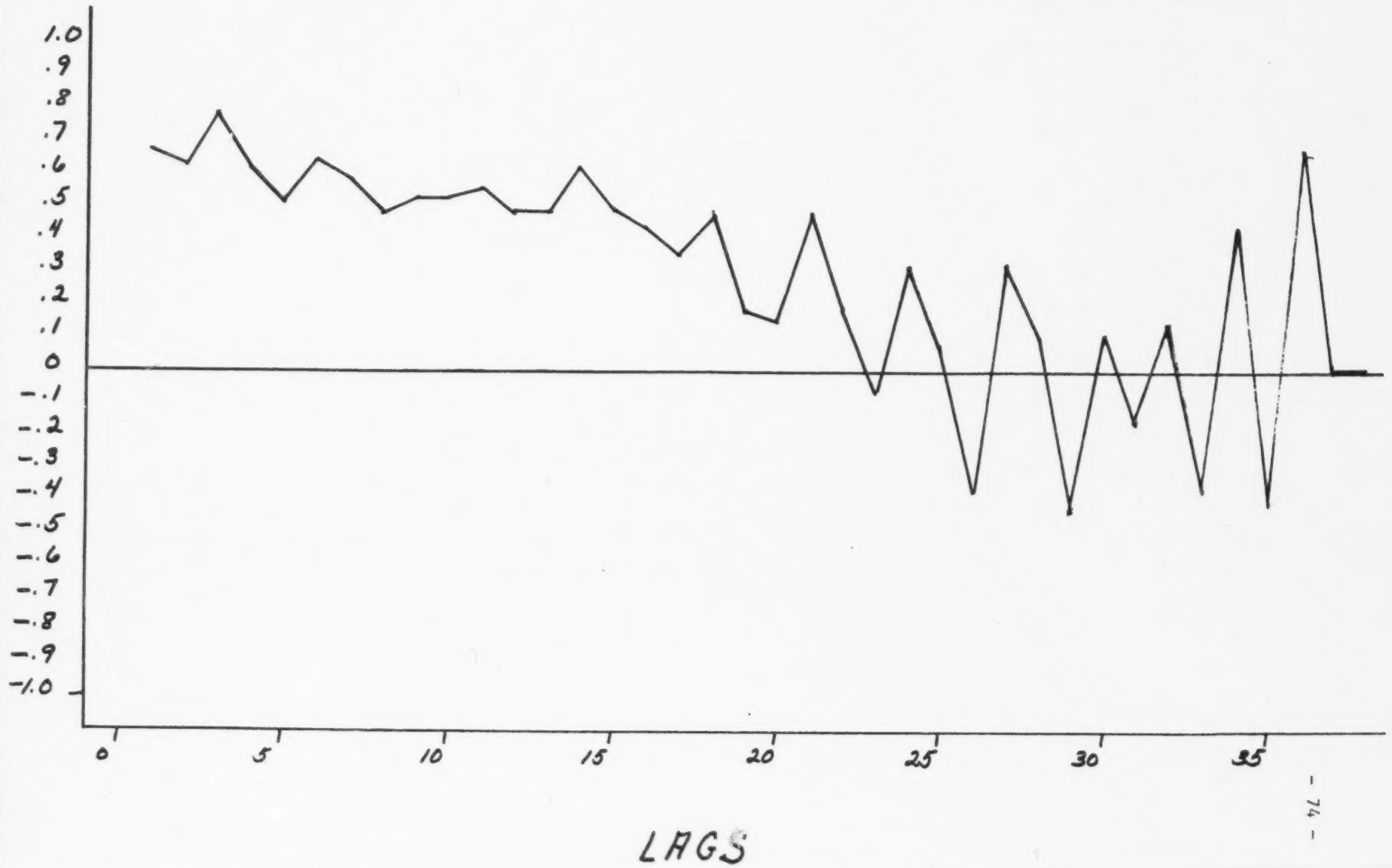
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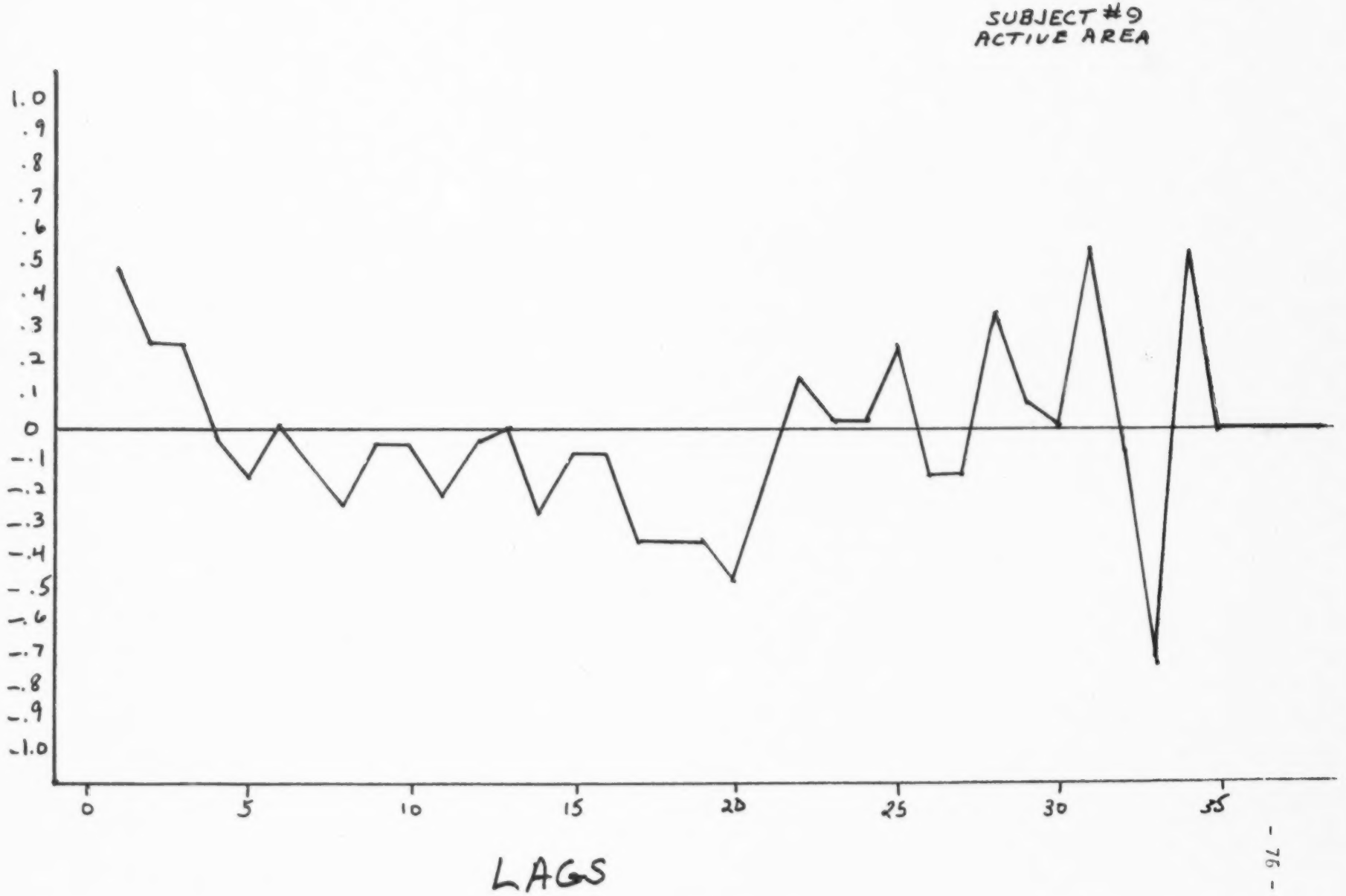
LAGS

Subject #9. This female child has the highest Binet IQ (147) in the entire sample. Her CA is average for the group. Participation in the Active Area was relatively low; she interacted with adults frequently and asked relatively more questions of them than her peers; her verbal interactions with peers was also relatively high.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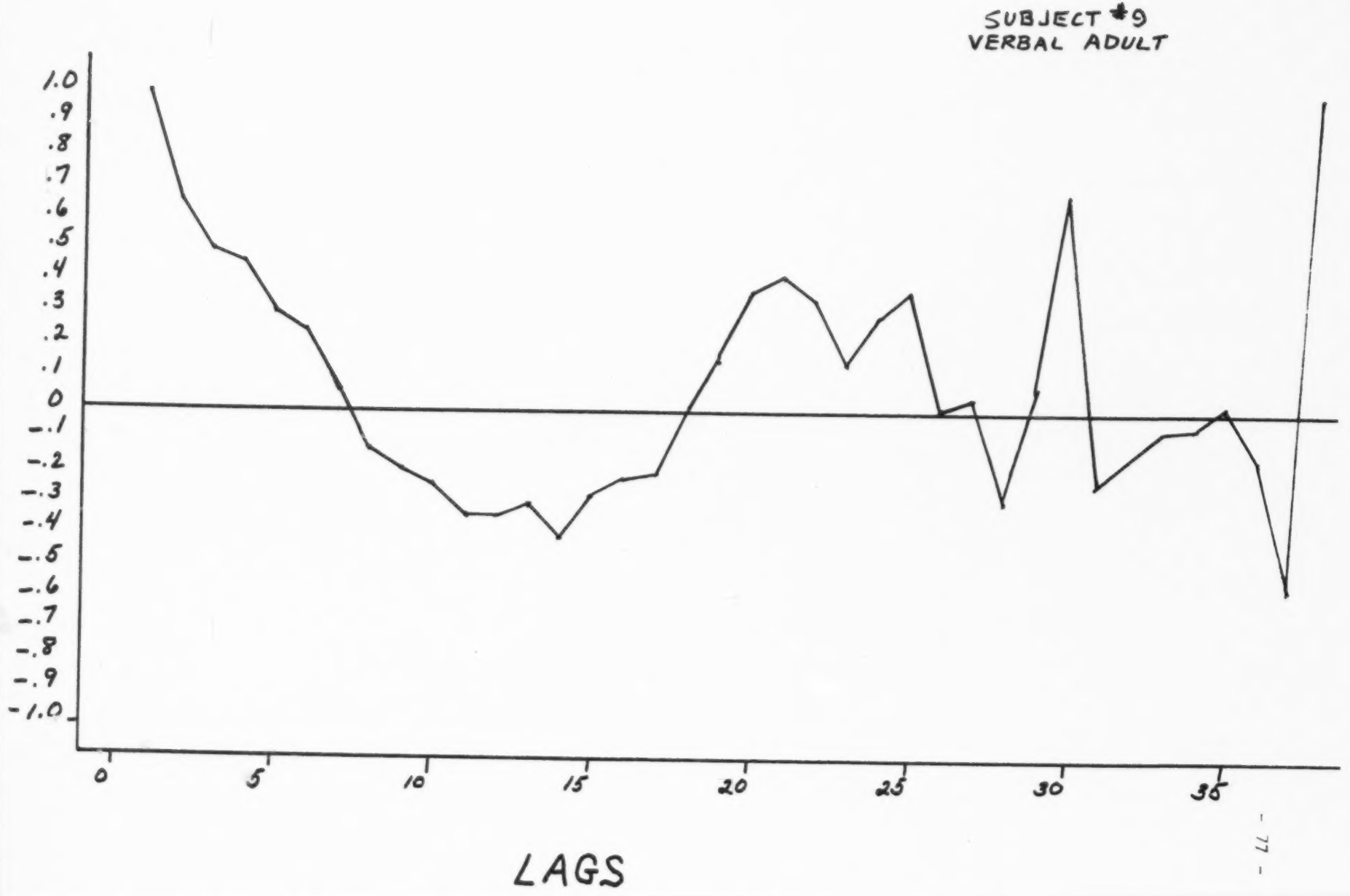
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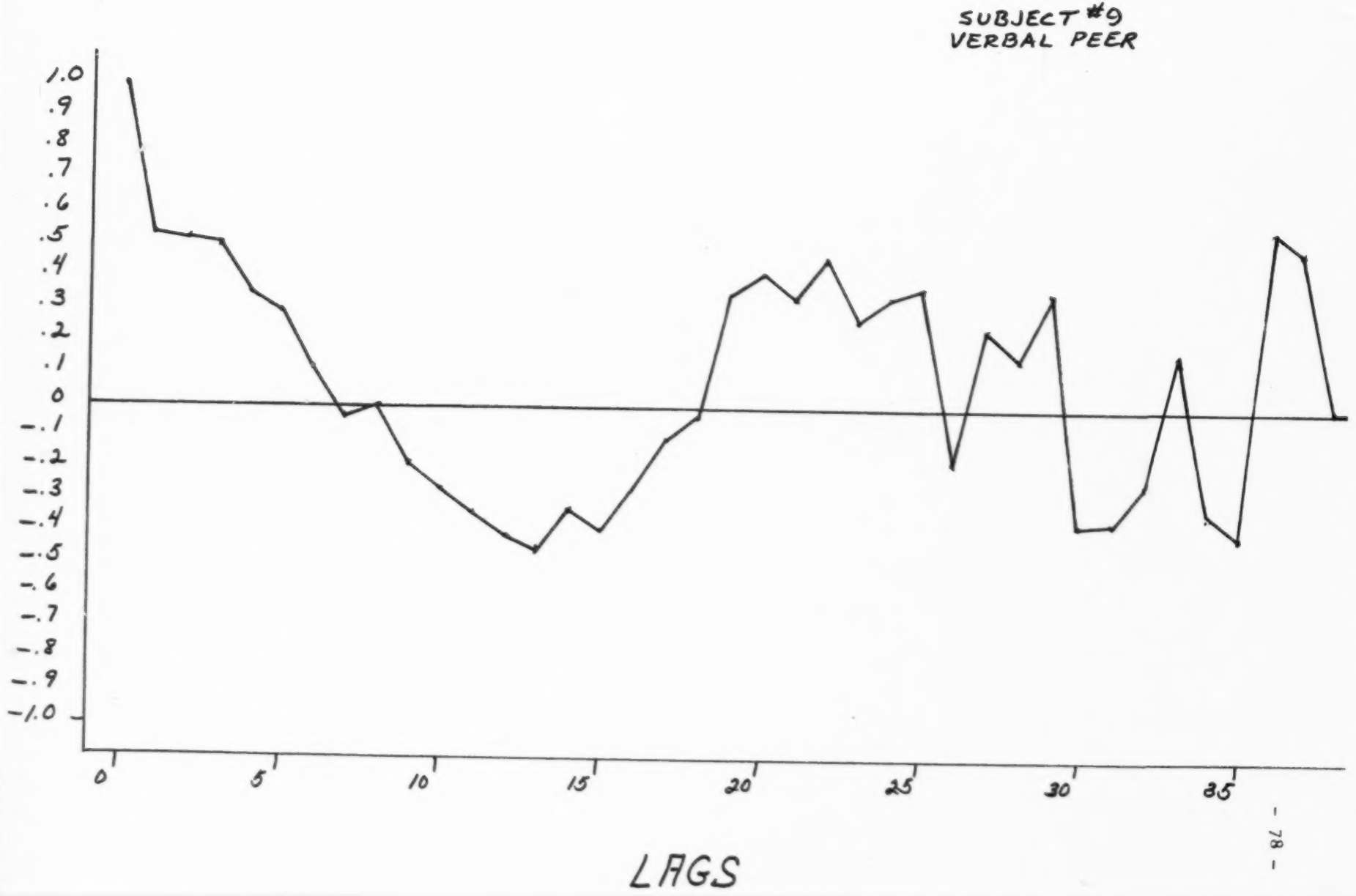
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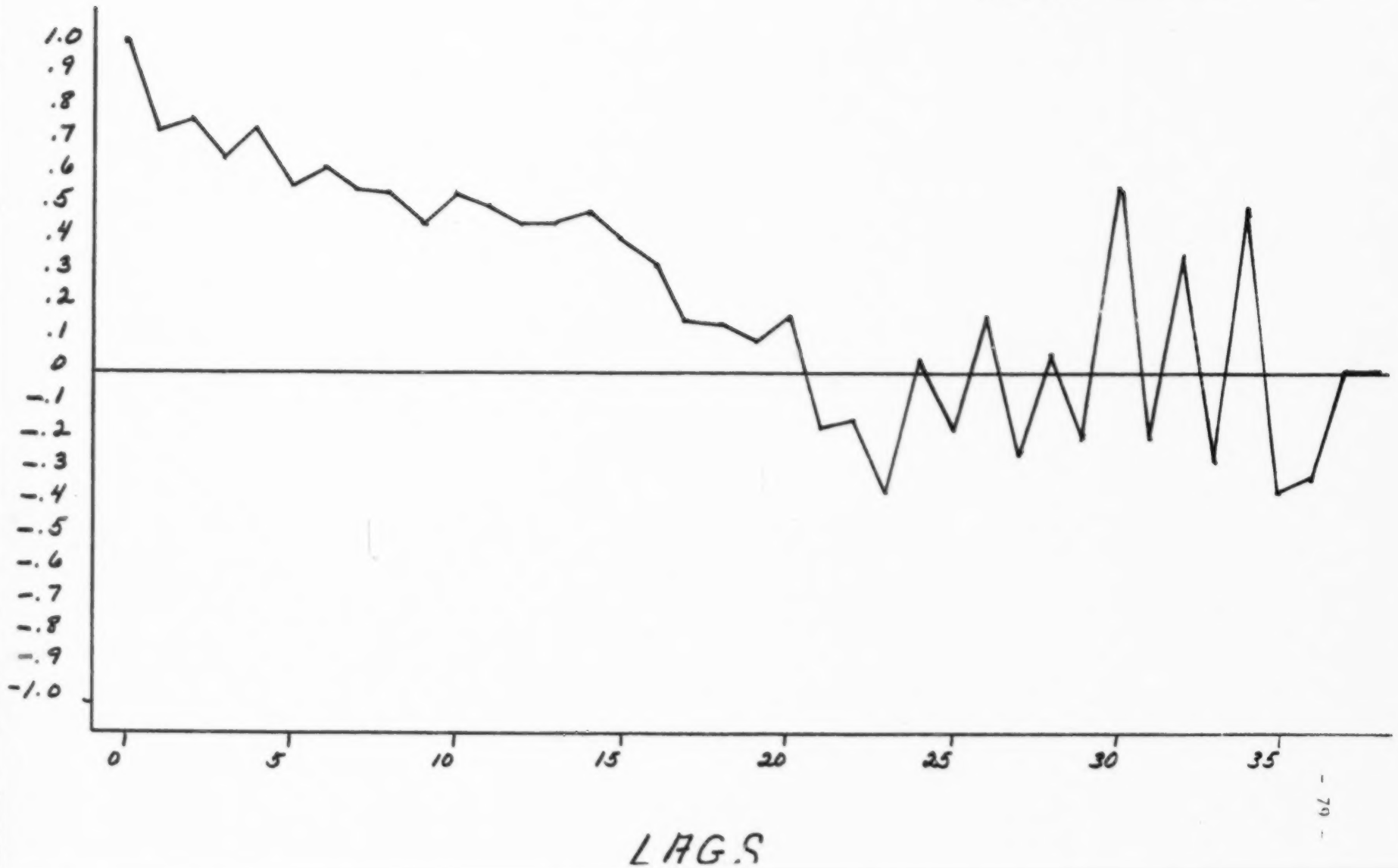
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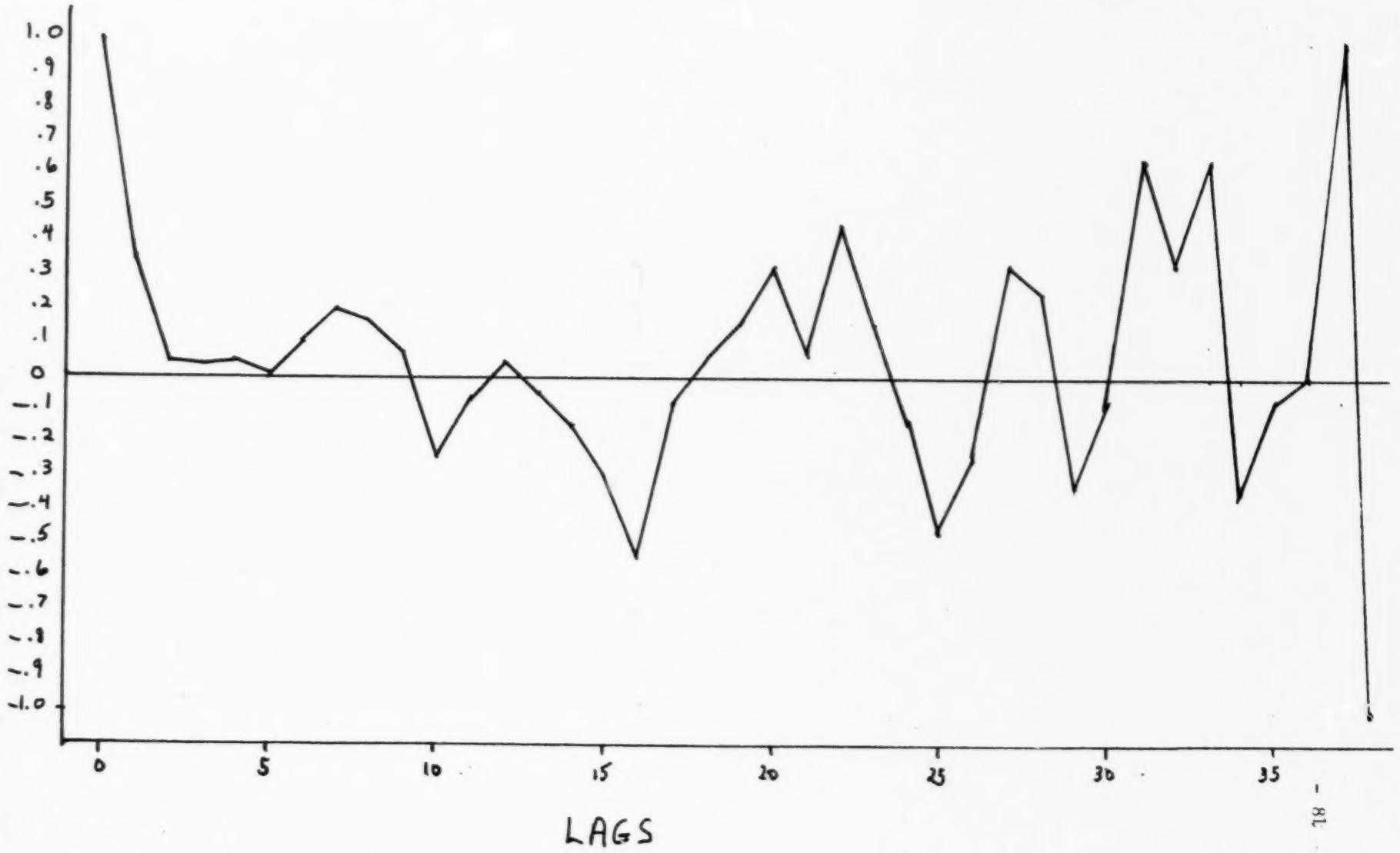
LAGS

Subject #10. This female child is also bright (IQ = 125) but was selected because of her extremely high frequency of participation in the Active Area (approximately 50% of her time). She interacted verbally with adults at a high level but asked relatively few questions. Her interactions with peers were at a high level.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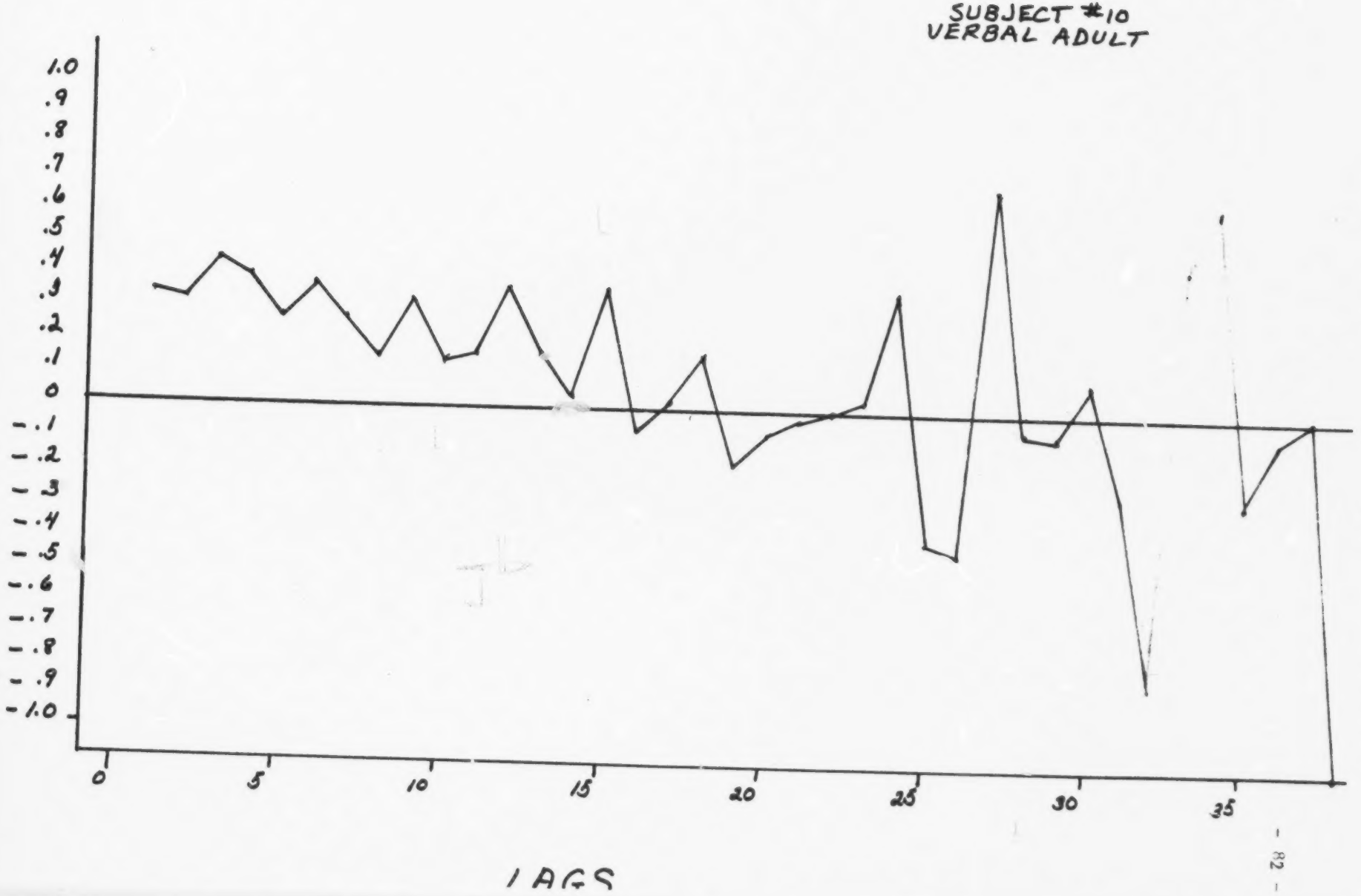
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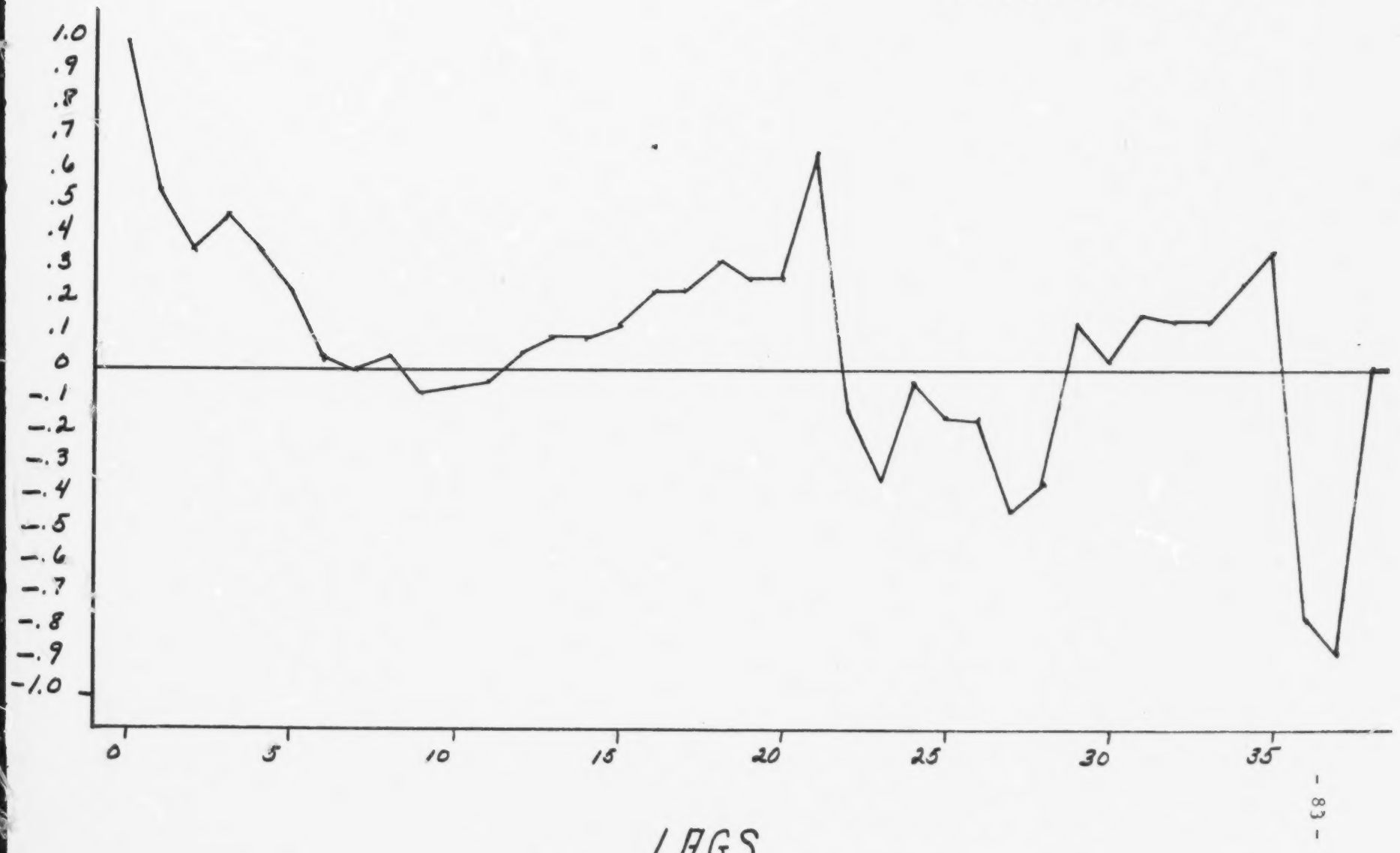
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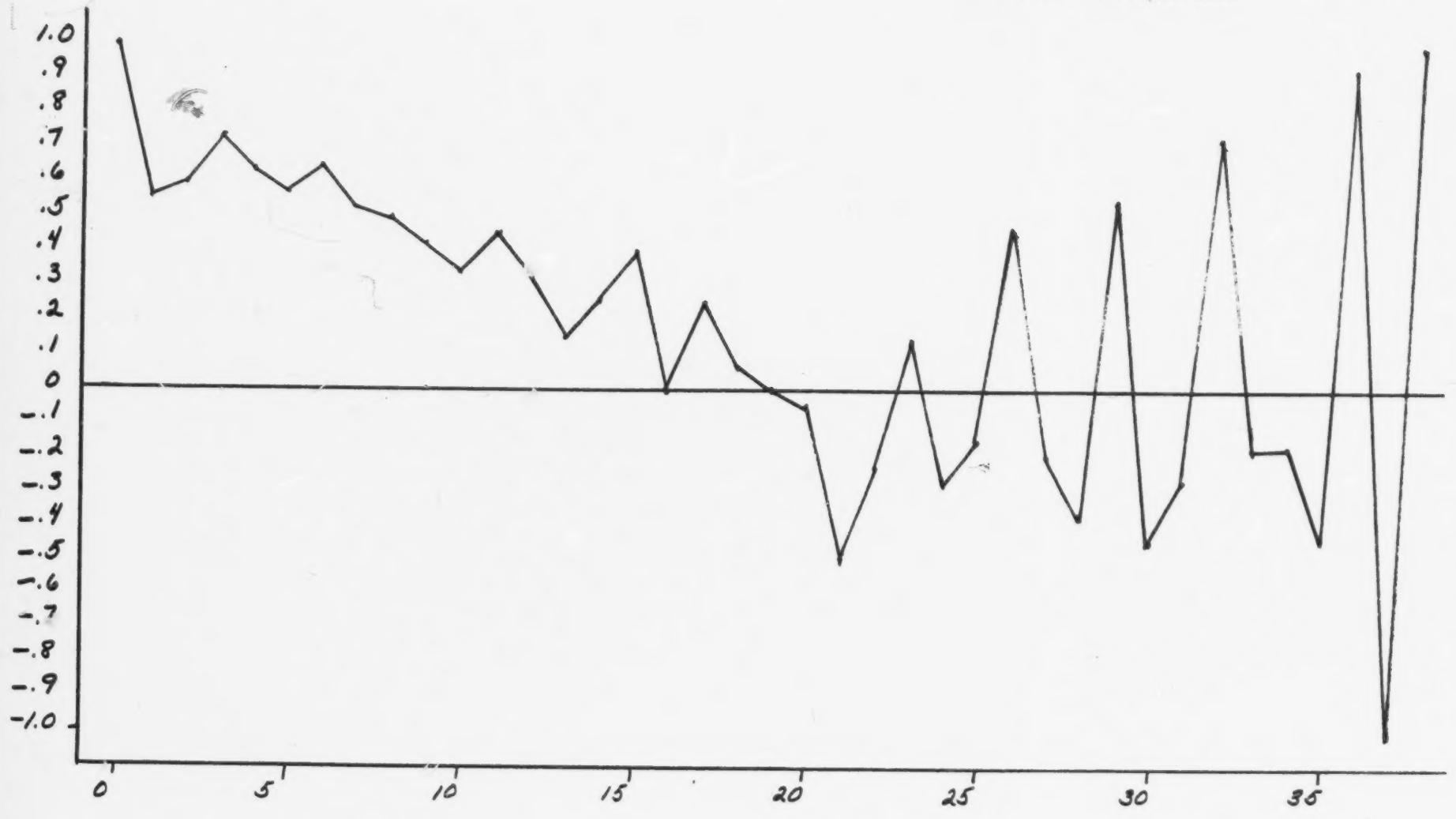
IAGS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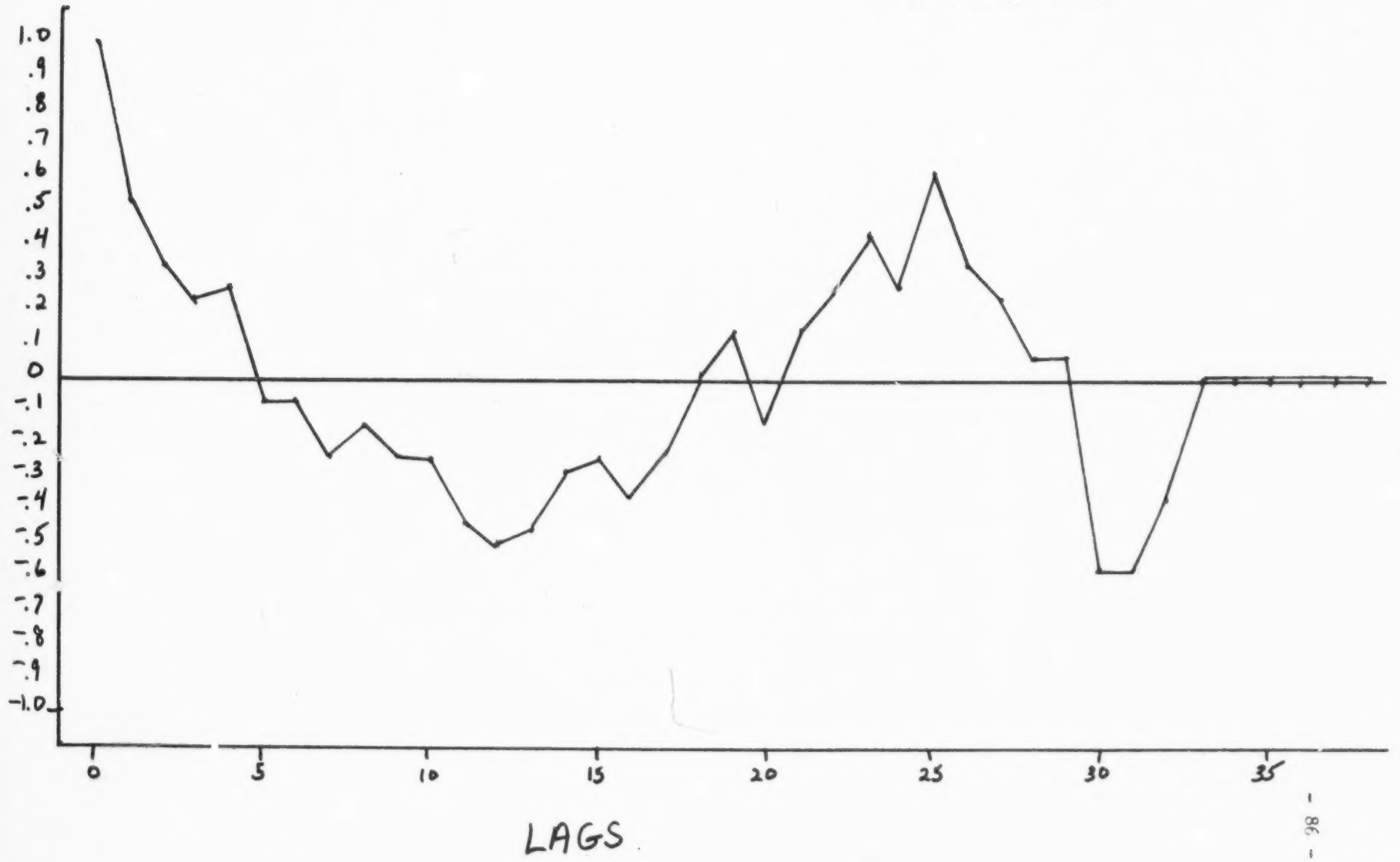
IAGS

Subject #11. This female child scored rather low on the Binet (IQ = 84). She participated in the Active area at an average rate and interacted verbally with peers and adults at a high frequency. She asked a very small amount of questions to adults. She is among the younger children.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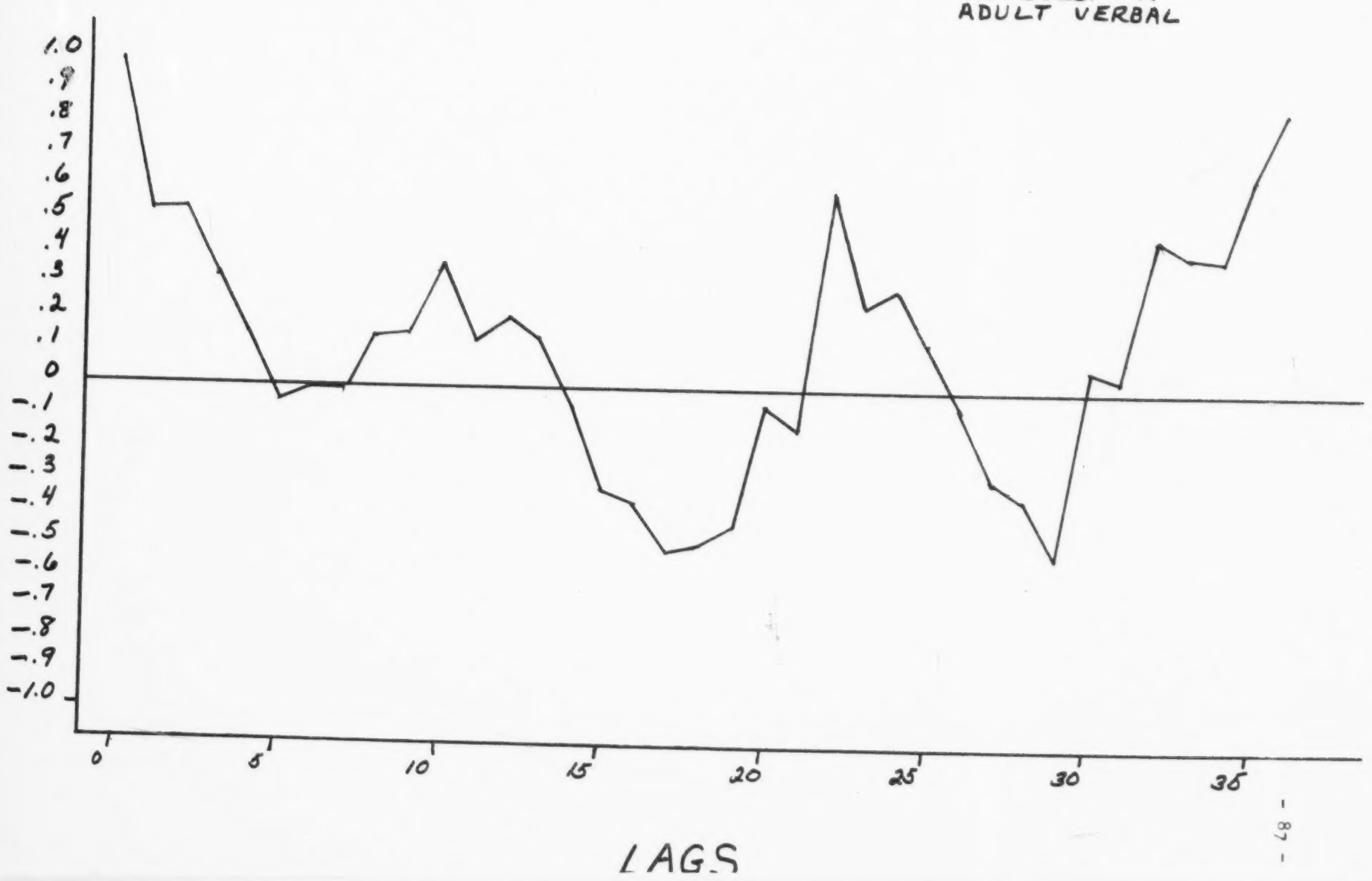
LAGS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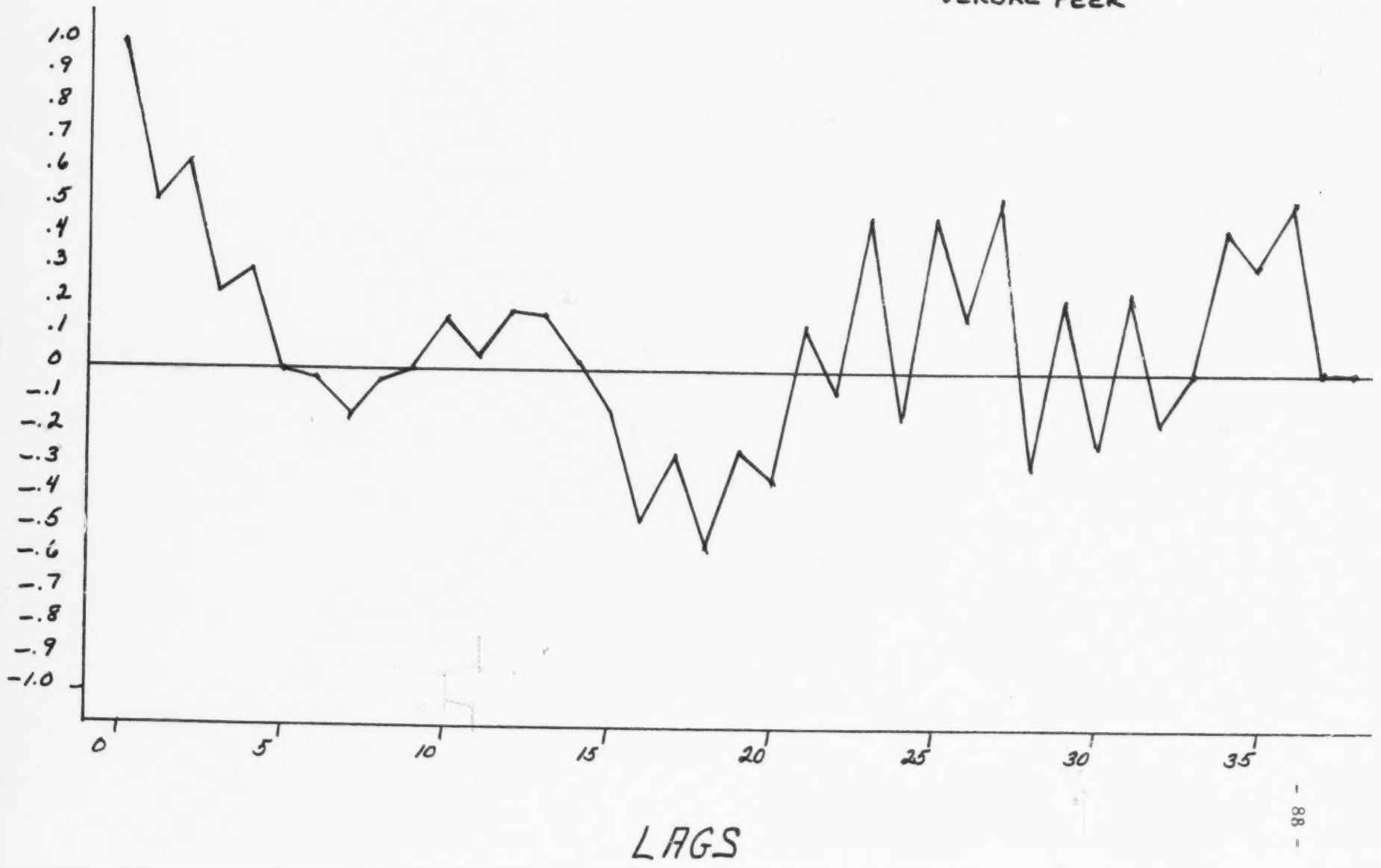
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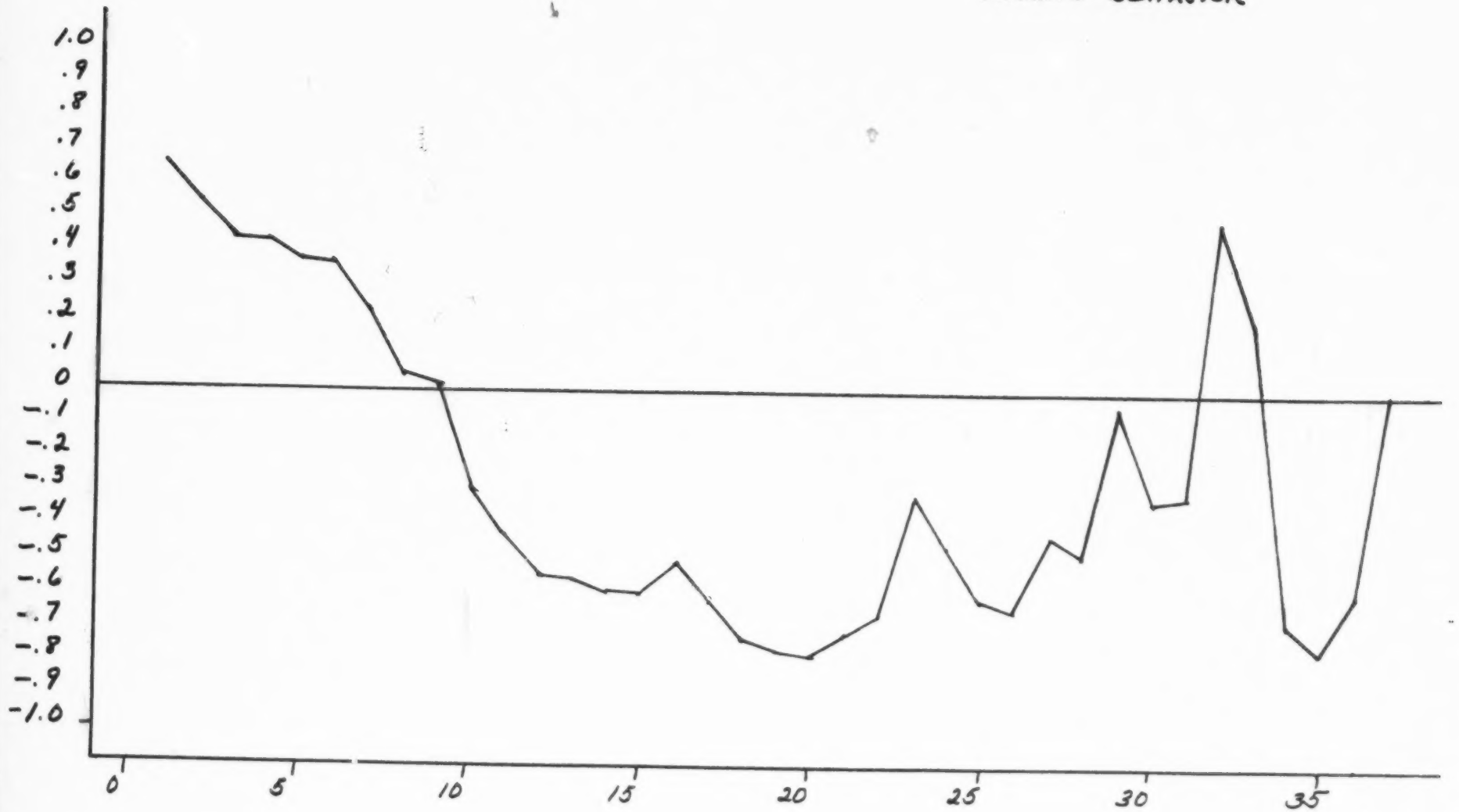
LAGS

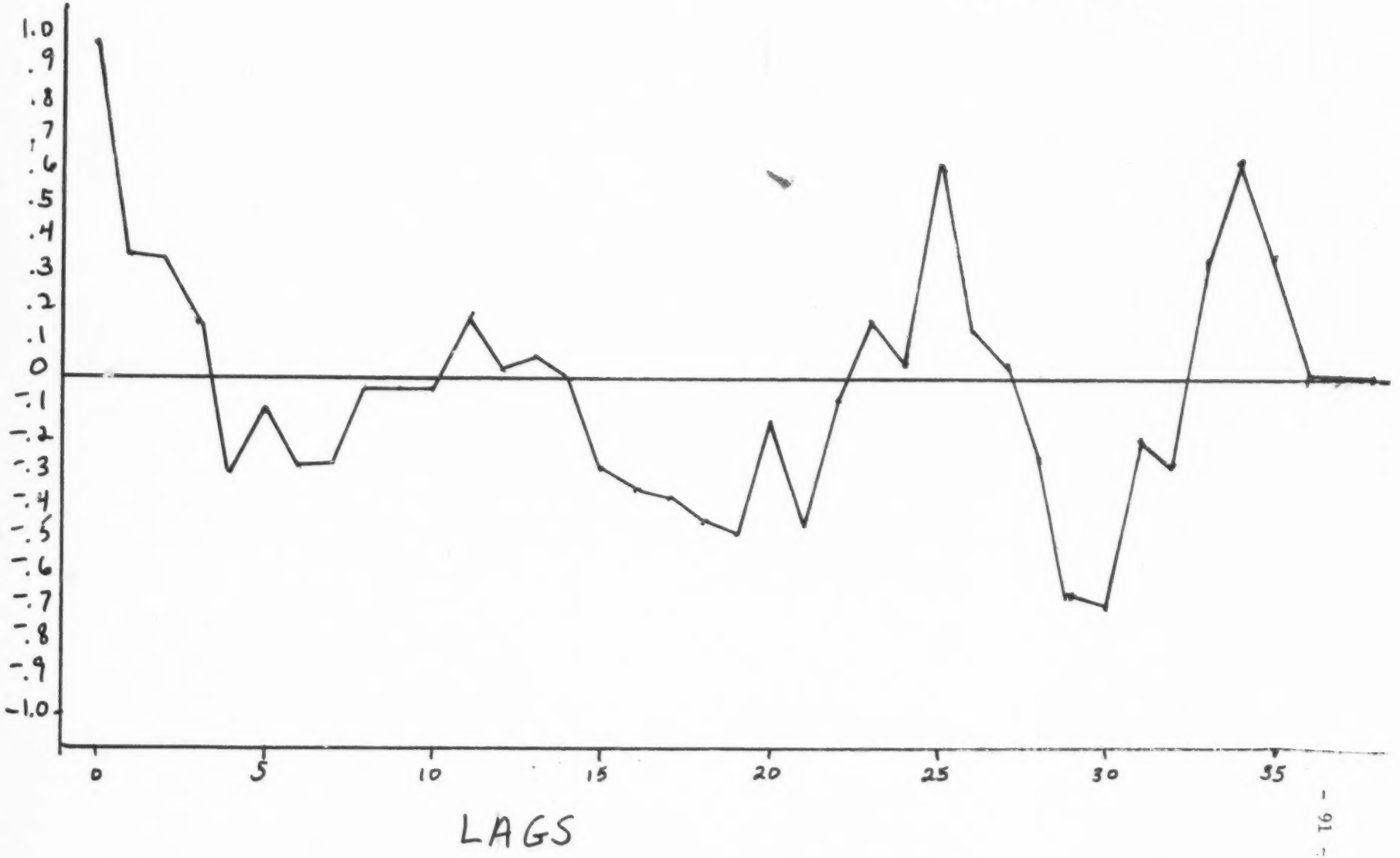
SUBJECT #11
ASKING BEHAVIOR

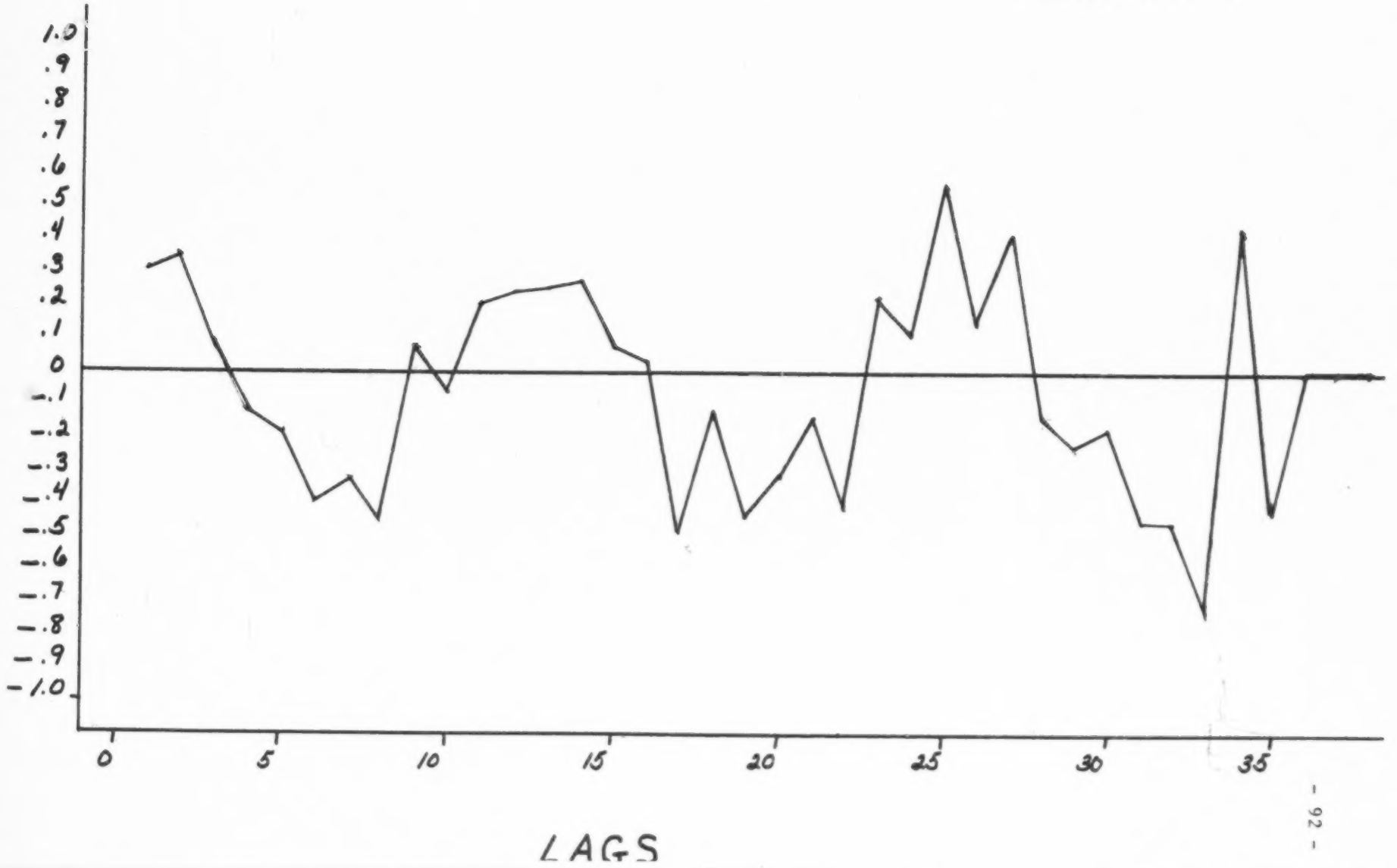


IAGS

Subject #12. This female child has average intellectual ability (IQ = 107), is older than the average child, and participated in the Active Area at about an average rate. She interacted at a relatively high level with adults, below average with peers, and asked adults a relatively high number of questions.

SUBJECT #12
ACTIVE AREA

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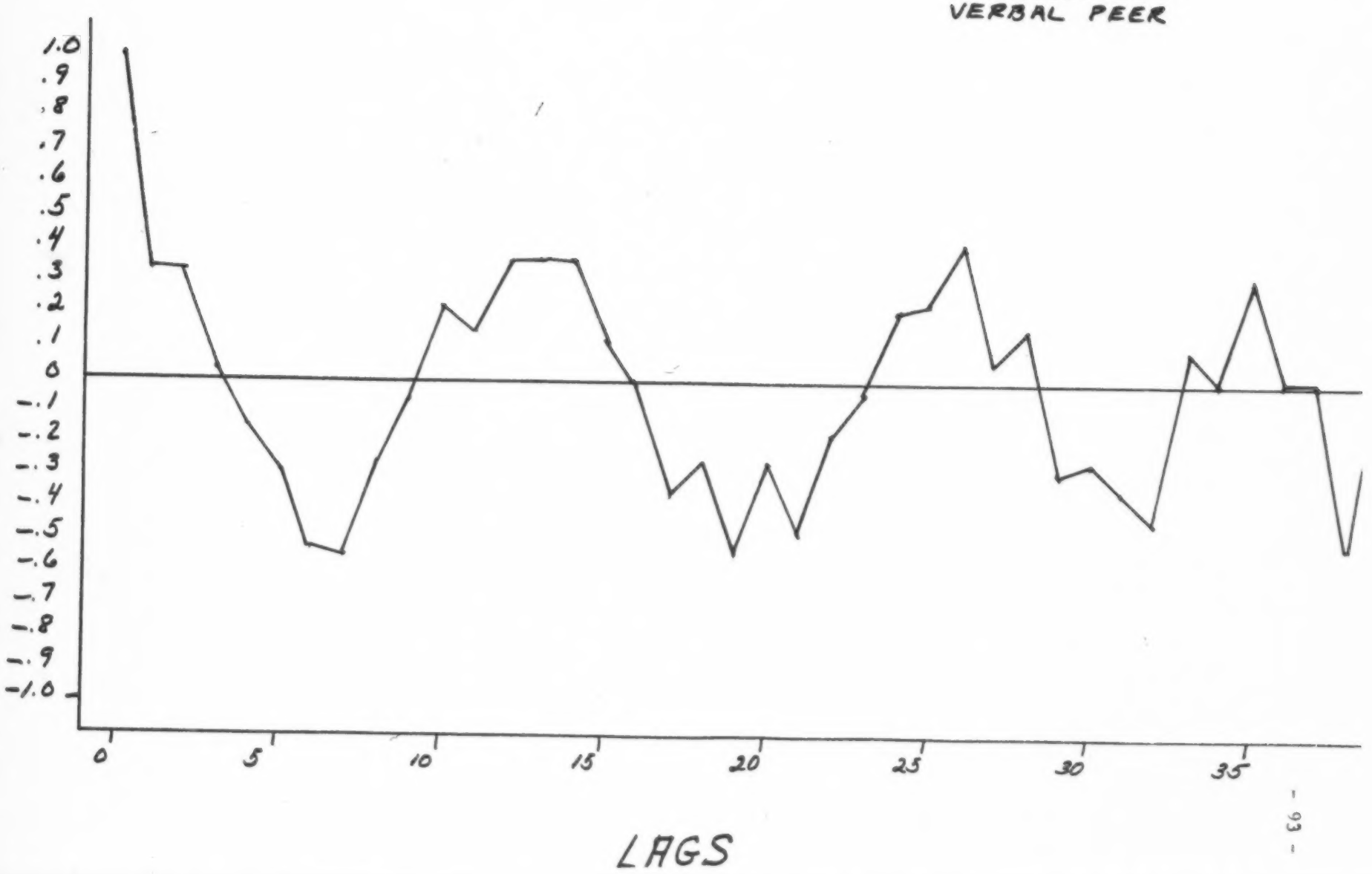
LAGS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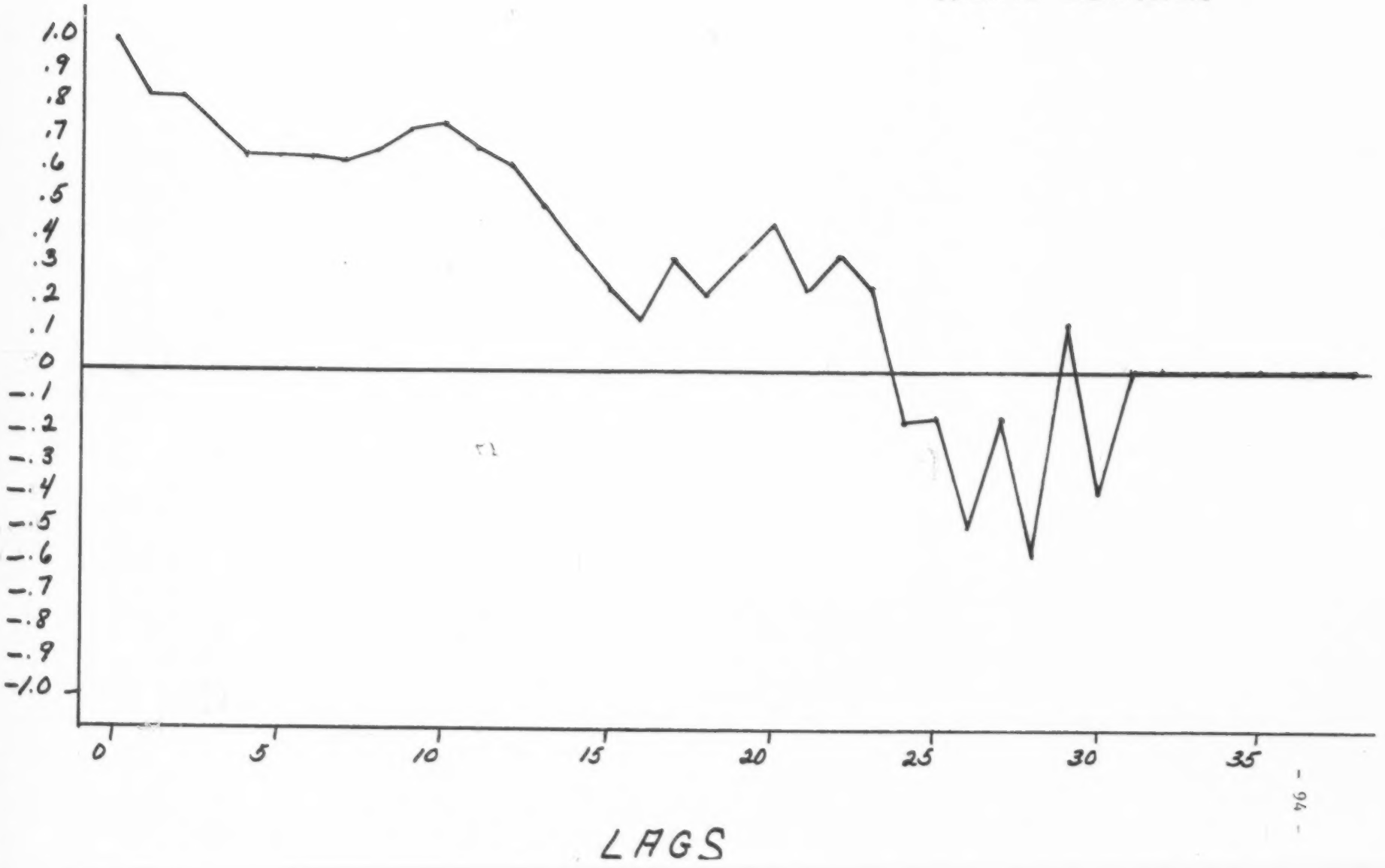
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Discussion

The data examined in this report describes the behavior characteristics of a group of 40 lower-class children in a day care program. A portion of the report describes differences in behavior in terms of sex and whether the children had prior (from infancy) day care experience. The data can also be viewed as describing the actual day care program, that is, the use children make of a planned educational environment when they are relatively free to do so.

Perhaps the most interesting question from a social, but not necessarily educational point of view, is the comparisons of the children with prior day care with those without prior day care. A previous report (Lally, Lay and Meyer, 1971) focussed on measures of intellectual ability which, in general, indicated little or no differences. The data generated from the present study focuses more on social behaviors. Here the picture is quite different; in general, the CC children displayed more positive social interactions than the contrast group. (Of course the same reservations concerning the adequacy of the sample that were raised in the study comparing the groups on measures of intellectual ability hold for these data.) At the very least, however, it can be concluded that within our meaning of positive social interactions, the effects of early day care were not adverse. It could be argued that the tendency of the CC group to interact with their own group, to the exclusion of the contrast group, is a negative effect. This finding must be examined with considerable care before any firm decisions are made. Several issues seem apparent: (1) propinquity is a generally powerful determinant of children's friendships and group alliances (see Thompson, 1962) regardless of whether they occur formally (day care program) or informally (street, neighborhood);

(2) propinquity as a determinant of alliances is not unique to any category of children; (3) friendships and group alliances change as the scope of the child's social world enlarges (Meyer, 1959) (the data reported in the present report were summed over the entire year thus masking any possible changes with time). Further anlayses of our data are warranted to determine if interaction patterns changed during the second year of the program.

A final comment with respect to the social interaction variables. Conceivably the higher incidence of positive social interactions among the CC children is the result of a higher output of social behaviors in general, both positive and negative. An examination of the negative interaction data shows a very sharp drop in frequency over time and thus fails to support the high activity explanation.

Comparisons of the groups with respect to area locations are somewhat more difficult to interpret. The major problem is in determining the psychological significance of differential use of areas. In a purely theoretical sense, it could be argued that the hierarchy Active-Expressive-Task represents a developmental gradient of maturity; that is, older, brighter, or more cognitively competent children show a greater preference for the task area. This interpretation ignores the fact that the two groups of children are roughly equivalent intellectually and, further, disregards the importance of play, especially imaginative play, for the cognitive development of children.

An alternative interpretation, equally tentative, integrates the location data with the social interaction data. Recall that the CC children verbalized with each other at a high rate and they also seemed to find greater satisfaction

in their own social interactions than from involvement with materials. These children, to a greater extent than the contrast group, seemed able to develop activities from within their own social milieu wherever or whenever there was sufficient space or opportunity. Since the ground rules for use of the Active area were more conducive to these needs, this area was employed more by the CC children.

The data also permit some tentative conclusions about the effects of the program with all of the children. Perhaps the most dramatic finding was the increase in frequency of positive social behaviors. A somewhat popular and stereotyped view of lower-class children is that they require a considerable degree of structure in order to function in a socially "acceptable" fashion. Whereas the middle-class child has been trained to behave acceptably and, furthermore, has the ability to provide a structure, the lower-class child is often viewed in completely opposite terms. The observation data simply does not support these assumptions about lower-class children. Clearly, through the consistent use of positive reinforcement the incidence of positive social behaviors increased with a concomitant decrease in negative social behaviors. It would be incorrect to assume that these changes occur quickly, say within the first two or three weeks. The fact is that the children require time and the initial months are rather hectic. Unfortunately, it is quite easy to become discouraged and revert to more direct methods of social control. Our data suggest that if teachers will maintain their positive behaviors the children will respond.

A question of major importance from this study is the psychological meaning of the differential use of areas. This problem has already been explored in this section leading to the general conclusion that many variables operate to determine area choices. An effort was made to examine the characteristics of children as they may relate to area use. What is clear from the data is that more research is needed to determine the significance for cognitive and social development of the play behavior that typically occurs in the Active area. Although a considerable amount of speculation about the meaning and importance of play has appeared in the literature, there has been little advancement in measuring the presumed variables. Unfortunately the scope of this project will not permit work on this important topic. That the children in this study used the Active area much more frequently than either the Expressive or Task areas cannot justifiably be viewed as a negative attribute of the program.

We shall turn now to the serial correlation analyses. As suggested earlier in this report, the use of this procedure was exploratory in the sense that it has not been widely used in psychology and education. Thus, psychological interpreations of the data are very much limited to the author's skills and imagination. It must be reiterated at this point, however, that any inferences can only be considered as highly tentative because of the nature of the data. Specifically, we are faced with the problem of not knowing the degree to which any one time period is an accurate reflection of the child's behavioral tendencies. In other words, since observations of each child in the sample were made at more or less randomly assigned time periods, it is possible that the serial correlations are confounded by these time periods. This situation

seems preferable to the alternative situation in which observations were always made at the same time. The latter situation could well have produced spuriously high correlations and would have been less representative of the child's general behavioral characteristics.

Clearly, the choice of children with diverse psychological characteristics did not influence in any apparent systematic way the resulting correlograms. Actually, this is not surprising since there were no a priori reasons for expecting the selection variables to effect the serial correlations -- except that IQ seems to correlate with so many variables. Thus the conclusion is warranted on the basis of these data that the degree to which behavior remains related to entering level is unrelated to the child's sex or intellectual ability as well as his entering level of behavior. It is not possible, of course, to determine if these effects are attributable to the program or whether we simply did not identify the appropriate predictor variables.

There was a general trend among the children for their question asking behavior of adults to maintain for a longer time period a higher serial relationship. Stated in somewhat different terms, questioning responses are apparently more powerfully related to predisposition status than any of the other observational codes examined. One might specualte that this reflects menaingful differences in how the children learned to perceive adults; either as a group to be avoided or as a group safe to approach with questions. Clearly the average child in our sample verbally interacted at a high level with our teachers and aides but their question asking behavior was at a low

level. Indeed, as noted earlier, we were not able to significantly modify this behavior. The correlograms generally suggest that, for both high and low frequencies of question asking behavior, initial status maintained its influence for a long period of time -- which is another way of saying that the program was, in a sense, successful in maintaining this behavior for those already predisposed to asking questions but unsuccessful in changing those who were initially low. This conclusion perhaps requires some modification because the serial rs do eventually show a downward trend. These findings suggest that the pervasiveness of entering level weakens later on in the program. An examination of the frequency data for each lag suggests no clearly defined trends; some children change positively and some negatively and, unfortunately, these changes are unrelated to entering status. In summary, this variable proved to be the most interesting of the four and is apparently the least susceptible to program effects.

The use of the Active area produced a variety of serial correlation patterns. For some children, entering level did not relate to subsequent behaviors even after one lag. At a highly speculative level, one might suggest that these children tended to sample more widely from the total environment available (Task or Expressive Areas) rather than limiting their interests to the single area. Clearly, from our viewpoint, this sort of searching behavior is preferable. The typical pattern suggests a high degree of serial relationship among the early lags and then an almost linear descent to through zero to, in some cases, a negative relationship. This result is quite consistent, in hindsight at least, with the expectation that the Active Area would be very attractive

to the children. Recall that in the Active Area they could be loud, very active, and generally unrestrained. Given the freedom to use the Area, they did so but it appears that something like a satiation effect occurred for many of the children. Instead of continuing heavy participation in the area, they later spent more time exploring other activities, albeit not to the degree anticipated. Nevertheless, these individual analyses suggest more clearly than the group analyses that the Active area was not that compelling to the children. Unfortunately, from our initial conceptualization, there was no tendency for the trends of the serial rs to correlate with entering intellectual ability.

The results with respect to verbal interactions with both adults and peers are, quite frankly, an enigma. These behaviors occurred at a high frequency and appeared, as expected, to maintain positive serial rs for a number of lags. It was therefore surprising to find in many cases a decelerating trend achieving negative relationships in some instances. Despite our misgivings about the latter findings, about which more will be said later, the general trend of the data suggest that the two behaviors are substantially related to entering characteristics.

With respect to the emerging negative serial correlations found for verbal interactions and the Active area, an alternative explanation emerges from the fact that the negative rs appear within the same general time period. Specifically, the trends may be confounded by seasonal variations whereby the children's locations shift because of the weather. Our initial observations occurred in October and November when it was still possible to be outdoors. In this case, individual frequency of locations may have shifted

during the winter months from outdoors to the Active area, thus changing the serial rs from positive to negative. Similarly, the shift from outdoors may have altered the opportunities for verbal interactions with more occurring indoors because of physical proximity. At least some support for this explanation can be gained from the data in figure 6 (p.3) where the group trends show an increase from time period 1 to time period 2 and then a decrease to time period 3.

In summary, the observational data, both in terms of the group analyses, and individual analyses, clearly show the inadvisability of characterizing programs by means of inclusive labels. Our data suggest that, at least in a relatively open environment, program characteristics are defined by the children. Conceptually, we would argue that this is the case even in highly structured programs. Furthermore, the serial correlation analyses show the advisability of paying attention to the problems of assessing change set forth by Bereiter (1963). Specifically, our data show that there is a distinct possibility of attributing change to program characteristics when in fact they are a function of the entering characteristics of the children. Perhaps more significantly, the correlogram profiles indicate a decided need for identifying better child predictor variables not for the sake of enhancing prediction but for the purpose of better understanding the nature of the interaction of child characteristics and program variables.

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